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MANUFACTURING METHODS & TECHNOLOGY

PROGRAM PLAN

CY 1981

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MAY 1981

MANUFACTURING TECHNOLOGY DIVISION
U S ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY
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DRCMT

DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA. 22333

14 MAY 1981

SUBJECT: 1981 DARCOM MMT Program Plan

SEE DISTRIBUTION (Appendix D)

1. Reference draft AR 700-90, Army Industrial Preparedness Program, para 3-8c(2), dated 24 June 1980.
2. The subject document submitted IAW reference in paragraph 1, describes the DARCOM Manufacturing Methods and Technology (MMT) Program for the period FY81-85. This plan was compiled by amending planning data submitted during January-February 1981. The amendments take into account subsequent programming actions taken since February; namely, FY81 project approvals and FY82 apportionment submissions.
3. Because of the dynamic nature of military materiel requirements and the constant change in technology, the inclusion of a project in this plan is not a guarantee of funding. However, the plan does indicate the current technology needs and interests of the DARCOM community.
4. Additional copies of this document may be obtained by writing the Defense Technical Information Center, ATTN: DTIC-TSR-1, Cameron Station, Alexandria, VA 22314

FREDERICK J. MICHEL
Acting Chief, Office of
Manufacturing Technology

1 Incl
CY1981 DARCOM
MMT Program Plan

FOREWARD

This document presents information for the DARCOM Manufacturing Methods and Technology (MMT) Program for Fiscal Years 1981-1985. The projects and funding levels for the out-years are for planning purposes only and will change based on technological developments and revisions in program requirements. Since total funding for these planned projects exceeds the projected funds for the Army's MMT Program, some projects will not be funded or may be slipped to later fiscal years. HQ, DARCOM and its subcommands and centers have the authority to reprogram funds to projects with higher priority, thereby affording the flexibility to accommodate new opportunities as they arise.

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INTRODUCTION

The MMT Program Plan

The MMT Program Plan, CY 1981, provides within a single source a summary of current and near-term efforts (FY81-FY85) included in the DARCOM MMT Program. Since weapons systems requirements and the technology for these systems are constantly changing, inclusion in the Program Plan is not a guarantee that an individual project will be funded. However, the Plan does serve as an indicator of the areas towards which DARCOM's resources will be directed and the magnitude of the Army's commitment to this program.

Organization of the MMT Program Plan

The Plan provides a section for each DARCOM element which has projects in the FY 81-85 period. Each section includes a summary of the activity, its responsibilities, and its major MMT thrust areas. Following this summary is a listing of each project proposed by that activity.

Individual project information is presented by the last four digits of the project number and includes the project title, funding, a brief description of the problem addressed by the project and the proposed solution. Projects are grouped according to broad categories and then further subdivided according to component. This arrangement points out major areas of emphasis and aids the identification of possible duplication of effort.

Industry Guide

An Industry Guide (Appendix A) has been included to aid in the use of the plan. The section will help clarify the interrelationships between the appropriations, commands, and personnel involved in the DARCOM MMT Program.

PROGRAM IMPACT

The MMT Program

The Manufacturing Methods and Technology (MMT) Program serves the US Army Materiel Development and Readiness Command (DARCOM) as a bridge between research and development and production. The program's primary aim is to reduce the cost of weapons system acquisition by improving the efficiency of manufacturing processes and by implementing new technology. Although cost reduction is a primary concern, the emphasis is also directed toward efforts reducing air and water pollution, increasing safety, conserving energy, reducing dependency on critical material, improving producibility and increasing productivity.

Need for MMT

The United States is in a period of low productivity growth with accompanying increased costs. The MMT Program is a major DOD tool to improve productivity and lower end item and spare/repair parts costs. The following excerpts illustrate the emphasis being given to the MMT Program by DOD and DARCOM.

Excerpt from the Overview Statement by the Under Secretary of Defense Research and Engineering to the 96th Congress, Second Session, 1980:

"Technology is being used as a tool to achieve major cost reductions in manufacturing complex weapons systems and high-quality production hardware in several important ways: Improvements in productivity and yield (e.g., computer-aided manufacturing), conservation of strategic materials resulting in reduced production lead times and costs (e.g., "near net shape" fabrication methods and substitution with less critical materials and composites); greater productivity (e.g., improvements in safety, pollution abatement, and energy use); and reliability through improved inspection and quality assurance methods. The Manufacturing Technology Program, a top priority program for increasing the introduction of innovation in the defense industrial procurement program, is funded at 150 million in FY81, representing approximately 0.4 percent of the defense procurement program".

Excerpts from the "Department of Defense Statement on the Science and Technology Program" by the Deputy Under Secretary of Defense for Research and Advanced Technology before the Research and Development Subcommittee of the Committee on Armed Services of the US Senate 96th Congress, Second Session, 5 March 1980:

1. "In addition to multiplying our force effectiveness through improved performance, new technology is required to address defense costs, acquisition barriers, and readiness. Requirements that must be addressed by technical solutions include: improved reliability (which is "designed-in"

and "manufactured-in" not just "tested-in"); life extension and durability of costly military hardware; conservation, substitution, and recycling technologies for critical material; increased productivity and reduced manufacturing cost in our defense industrial base; the capability to substitute synthetic fuels for petroleum-based fuels; and improved human engineering to better match operational demands of new equipment to training and readiness levels. Advanced Technology Developments and the Manufacturing Technology Program provide great potential for meeting these requirements and accordingly deserve stronger emphasis in the future than is represented in our FY 1981 budget request. I intend to continue to give strong emphasis to these important elements of the S&T Program as well as . . ."

2. "Much attention has been given to the lack of increased productivity and innovation within US industry. Probably the single most effective program within the DOD to attack this problem and to improve our defense industrial preparedness is the Manufacturing Technology Program. We are working very closely with the military departments and with industry to further strengthen the program. We are striving to provide better visibility for active and completed projects to better articulate the cost savings and productivity improvements which accrue to the DOD (and to the American industry in general)".

3. "The Manufacturing Technology Program (MTP) is an aggressive DOD initiative to exploit innovative manufacturing concepts which show potential to reduce material acquisition costs and to improve industrial productivity . . ."

Excerpts from, "The Department of Defense Statement on Industrial Readiness" by the Under Secretary of Defense for Research and Engineering, before the Defense Industrial Base Panel of the Committee on Armed Services, United States House of Representatives 96th Congress, Second Session, 3 December 1980:

1. "The DOD Manufacturing Technology Program is clearly an extremely important vehicle for improving the health of industry, and one which I fully support . . ."

2. "I consider that my principle proposal as a manager in a defense program is to focus emphasis, to focus priority on the issues that I think are most important. And in the Technology Base I have chosen to focus those on three areas. One of them which you are well familiar with is the very high-speed integrated circuits. A second is the manufacturing technology program which GEN Slay described to you. And the third, which I pull out as a separate item, although it is part of manufacturing technology, is this rapid-solidification technology . . ."

Excerpt from a statement by General John R. Guthrie, Commanding General, US Army Materiel Development and Readiness Command before the Industry Preparedness Panel of the House Armed Services Committee, Second Session, 96th Congress, 14 November 1980:

"In this latter regard, I would like to comment on two points which were raised by the Defense Science Board last summer and which I believe Dr. Fuhrman addressed in his testimony before the panel in September.

"The first point concerns service Manufacturing Technology (MANTECH) Programs. In his statement, Dr. Fuhrman said that the DSB recommended that a reasonable portion of each service's procurement budget be devoted to MANTECH Programs. Although he did not specify a percentage, the DSB, in its report, called for annually funding MANTECH to 1% of each service's procurement budget.

"While I understand and support the thrust of the DSB's effort to index MANTECH to procurement expenditures, I suggest that a 1% level may be inadequate. Based on the potential benefits and merits of the project proposals submitted to us on the opportunities we envision, I would be quite willing to see the funding level rise to some 2%, or possibly higher when special opportunities arise and are fully justified.

"Further whatever base percentage is finally agreed upon, I believe that figure should represent a floor which should not be breached by DOD or any other services: . . ."

This strong emphasis was reiterated by General Guthrie during an appearance before the Industrial Preparedness Panel of the House Armed Services Committee, First Session, 97th Congress on 30 April 1981.

New Systems

An expanded MMT program is necessary to support the production base being established for the new systems of the 1980's required to modernize our forces and improve readiness. These systems will run the gamut from tanks to helicopters to ammunition, missiles and vehicles. A new tank, the M-1, is now coming off the assembly line. In addition, the Army will have a new fighting vehicle for infantry. Two new helicopters, one devastating against armor and the other vital to our mobility and logistics, will be built. The latter, the Blackhawk, has already been fielded. Also developed in the last few years and entering into production is a laser-homing artillery shell capable of first round hits against moving targets at 15km. The Artillery will be receiving its first multiple rocket launcher capability in 30 years. The Airborne and Air Mobile Forces are being given the first new Howitzer, the M198, since World War II.

In the area of air defense, development has been completed and fielding of the Patriot missile system has begun. Another new air defense system that will be fielded is the Roland. Also under development is the Division Air Defense Gun.

Command Systems include an integrated Army tactical communications objective system (INTACS) which consists primarily of equipment systems developed under TRI-TAC, TACSAT, SINCGARS, and associated COMSEC programs that will provide for responsive, secure, jam-resistant, mobile and highly automated tactical communications. The Army Helicopter Improvement Program (AHIP) is in support of intelligence, surveillance and target acquisitions. This program is looking at the OH-6 and OH-58 as candidates for an interim Scout helicopter. Following the AHIP Program, if cost justifiable, the advance Scout helicopter will be pursued with a new air frame designed specifically for the Scout mission. Also, currently being developed is a remotely piloted vehicle to provide surveillance and target designation behind enemy lines. The Army is fielding its firefighter radar systems which are capable of detecting incoming mortar artillery and free rockets and provide instant target data on point of origin before the incoming rounds hit. In the air, the stand-off target acquisition system (SOTAS) mounted on a Blackhawk helicopter will be able to detect and locate moving targets, targets which are miles behind enemy lines, from a relatively safe position behind our line.

The combat support mission area planning trends in the engineering area include: a "combat excavator" for rapid field fortification construction; soil stabilization system; logistic-over-the-shore (LOTS) operation; rapidly implaced water storage bladders and hoses; mobile well-drilling equipment; waste water reuse equipment and improved filtering of saline and NBC contaminated water; new wet-and-dry-gap bridges; and rapid crossing sites access/egress systems.

In the mine/countermine area, Army is developing a family of scatterable mines (FASCAM), which allows rapid delivery of massive amounts of antitank and antipersonnel mines by artillery, aircraft, or ground distribution. In the countermine area, Army is developing a surface-launched fuel air explosive, that uses the devastating shock of fuel air explosive to rapidly clear paths in the minefields. A mine clearing roller has just been fielded which attaches to the point of the main battle tank and is capable of safely detonating and clearing any known pressure-sensitive mine.

In the area of night vision, Army is in the third generation of passive night vision devices, popularly known as starlight scopes. The size and weight has been reduced and the blooming problem caused by sudden bright light such as flares or muzzle flashes has been reduced. Developments in the night observation area will include: development of third generation light amplification devices, focal plane arrays for thermal imaging, millimeter wave radars and CO2 laser for target acquisition and fire control.

Procurement of various size generators has continued to provide general purpose power sources for field units. In addition, the DOD family of standard generators and associated equipment will be utilized to provide power sources for PATRIOT, CHAPARRAL, TACFIRE, HAWK, and a variety of other missile and air defense systems. Initial procurement of the silent lightweight electrical energy plant (SLEEP) model begins in FY84, and continues with the 3 KW, 5 KW, and 10 KW during the next 10 years.

MMT Thrusts

The thrusts of the program are divided into two categories. The first category - Program Thrusts - is aimed at improving the overall management of the program. It is aimed at getting the most out of the program, both for Army and the industrial base, per dollar expended. The second category - Technology Thrusts - is aimed at the technical areas important to fielding the weapons systems of the 1980's.

Program Thrusts

- Support Procurement
- Improve Implementation
- Identify Cost Drivers
- Apply Foreign Technology
- Improve Technology Transfer

Technology Thrusts

Large Scale Integration (LSI)	Flexible Machining Systems
Very High Speed Integrated Circuits (VHSI)	Group Technology
Gradient Index Optics	Computer Aided Design and Manufacturing
Silicon on Sapphire (SOS)	Computer Integrated Manufacturing
Fiber Optics	Robotics
Pressed Lenses	Laser Applications
Plastic Optics	Materials Substitution
Chalcogenide Glass Optics	Near Net Shape Processing
High Frequency Gallium Arsenide	Surface Treatment
Microwave Integrated Circuits	Joining-Automated Control
Composites	Ceramics
Air and Water Pollution Abatement	Metal Removal
Energy Conservation	High Speed Machining
Recycling	Powder Metallurgy
Demilitarization	Safety
Flexible Ammo Metal Parts Lines	Ammunition Cast and Press Loading
Automated Material Handling	Automated Test and Inspection

SUMMARY

SUBMACOM SUBMISSION TO MMT PROGRAM
BY COMMAND (Thousands of Dollars)

<u>Command</u>	<u>Fiscal Code</u>	<u>Appropriation</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>
ARRADCOM/ARRCOM	4250	Ammunition	25999	30383	31109	32330	40749
	3297	Weapons	7082	10733	14831	19235	15839
	5397	Other Support	3291	3174	2236	5855	5460
AVRADCOM	1497	Aircraft	9843	13009	15285	17825	19685
CECOM	5297	Communications/Electronics	4281	2892	5812	4950	1000
ERADCOM	5297	Communications/Electronics	4904	7212	15550	18950	14500
DARCOM/AMMRC	5397	Other Support	4783	5580	5850	6350	6350
MICOM	1497	Aircraft	0	0	400	0	0
	2597	Missiles	15888	12156	25055	29372	26215
	4250	Ammunition	915	0	1300	1225	950
	5297	Communications/Electronics	0	0	0	250	250
	5397	Other Support	661	800	800	800	800
MERADCOM	5397	Other Support	1379	0	3127	1227	814
	3197	Tracked Combat Vehicles	0	968	808	948	0
TACOM	3197	Tracked Combat Vehicles	6114	14955	23693	26330	27867
	5197	Tactical & Support Vehicles	737	967	1005	2240	1325
TECOM	5397	Other Support	750	1010	1300	1400	1500

SUBMACOM SUBMISSION TO MMT PROGRAM
BY APPROPRIATION (Thousands of Dollars)

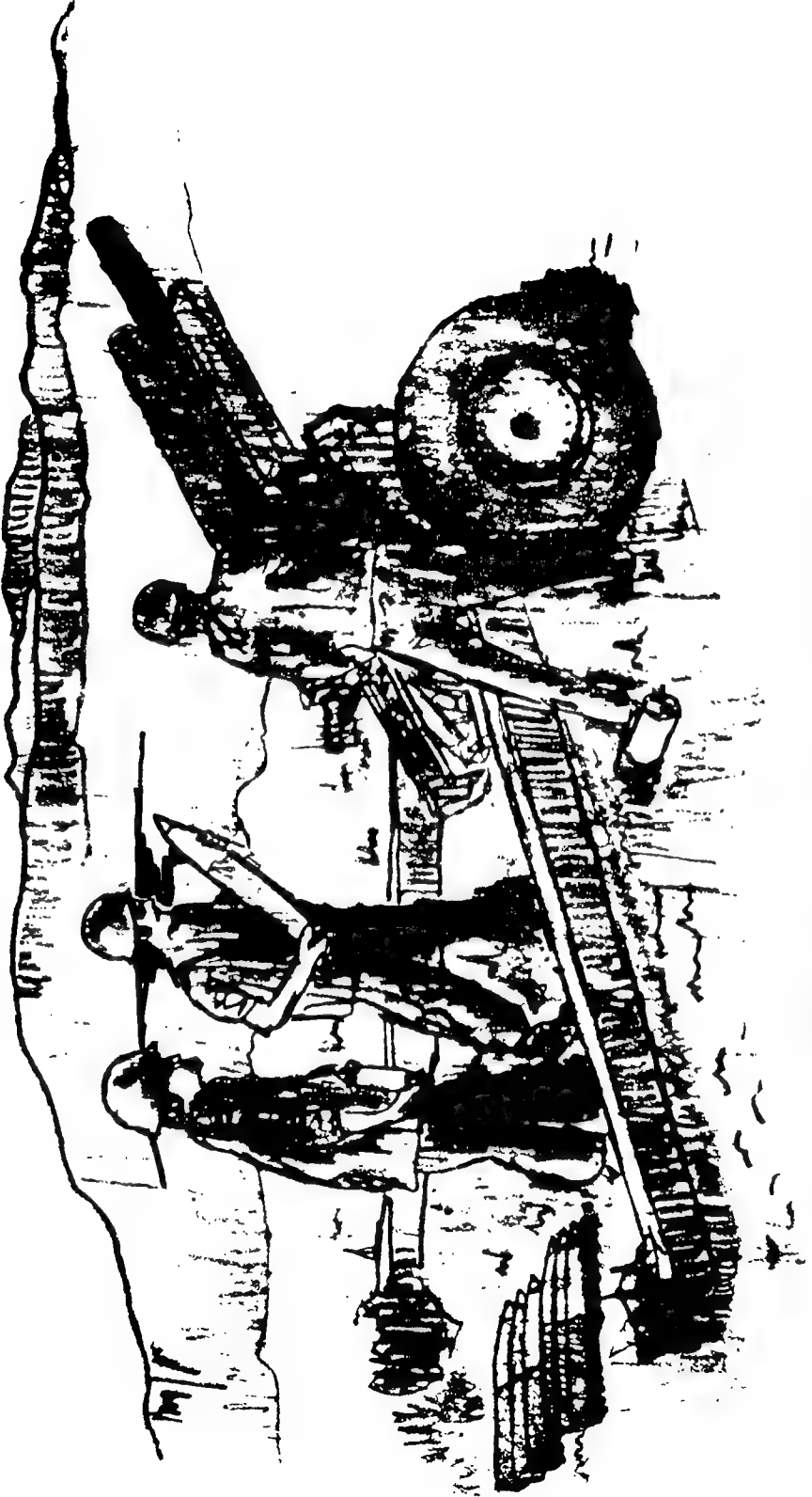
<u>Appropriation</u>	<u>Fiscal Code</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>
Aircraft	1497	9843	13009	15685	17825	19685
Missiles	2597	15888	12156	25055	29372	26215
Tracked Combat Vehicles	3197	6114	15923	24501	27278	27867
Weapons and Other Combat Vehicles	3297	7082	10733	14831	19235	15839
Ammunition	4250	26914	30383	32409	33555	41699
Tactical and Support Vehicles	5197	737	967	1005	2240	1325
Communications/Electronics	5297	9185	10104	21362	24150	15750
Other Support Equipment	5397	<u>10864</u>	<u>10564</u>	<u>13313</u>	<u>15632</u>	<u>14924</u>
TOTALS		86627	103839	148161	169287	163304

ANALYSIS OF PREVIOUS PLANNING DATA

<u>CY of Plan</u>	<u>Period Covered*</u>	<u>Percent of Submission Previously Planned</u>	
		FY82 <u>Apportionment</u>	
1976	FY78 - FY82	16.0%	
1977	FY79 - FY83	19.6%	
1978	FY80 - FY84	29.0%	
1979	FY79 - FY83*	40.1%	
1980	FY80 - FY84	88.9%	

This chart shows the percentage of projects currently in the review cycle which were planned in previous years' long range plans.

*Starting in 1979, the planning period covered was changed to reflect the more immediate future, rather than the POM years.



**ARMAMENT R&D COMMAND
(ARRADCOM)**

**ARMAMENT MATERIEL READINESS COMMAND
(ARRCOM)**

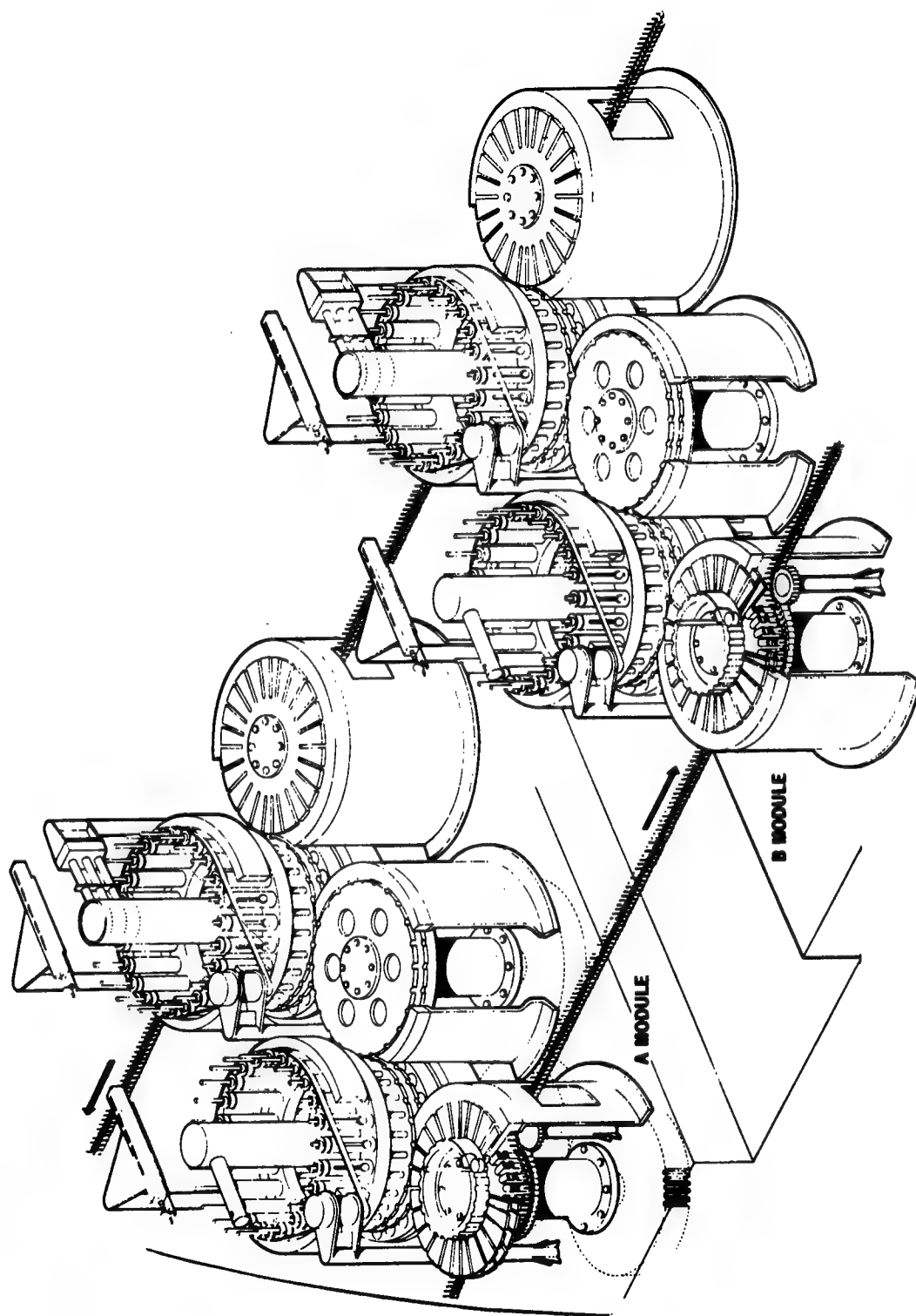
US ARMY ARMAMENT MATERIEL READINESS COMMAND (ARRCOM)
AND
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND (ARRADCOM)

ARRCOM, with headquarters at Rock Island, IL, is the DOD Single Manager for Conventional Ammunition (SMCA). ARRCOM is responsible for integrated logistics (material readiness) management of nuclear and non-nuclear weapons and munitions. This includes follow-on procurement, production, engineering in support of production, industrial management, product assurance, material management, maintenance, value & logistics engineering, international logistics, and transportation and traffic management for assigned armament systems/materiel. As SMCA, it has responsibility for procurement, production and wholesale management of common-user conventional ammunition for the Army, Navy, and Air Force.

ARRCOM's materiel assignments include artillery, infantry, air defense guns, surface vehicle and aircraft mounted weapons systems, rocket and missile warhead sections, demolition munitions, offensive and defensive chemical materiel and related training equipment, test equipment, and tools. ARRCOM directs operations of four assigned arsenals, a Government-owned, Government-operated ammunition plant, twenty-seven Government-owned, contractor-operated (GOCO) ammunition plants, and an Army ammunition activity.

ARRADCOM is responsible for all research, development, and life cycle engineering of assigned weapon systems. Its mission also includes initial low-rate production for conventional systems and life cycle procurement and production for nuclear munitions. ARRADCOM also executes assigned missions in support of other DOD elements having centralized management responsibility for specific weapons systems or items. In addition to large-caliber, small-caliber, mission support and headquarters staffs at Dover, NJ, command elements include the Chemical Systems Laboratory and the Ballistics Research Laboratory at Aberdeen Proving Ground, MD, and Benet Weapons Laboratory at Watervliet, NY.

Integrated into ARRCOM's structure is the US Army Munitions Production Base Modernization Agency (MPBMA). The Agency is responsible for project management of the Munitions Production Base Modernization Program. The Agency exercises centralized management authority over the planning, direction, control and execution of the Program at all US Army Ammunition Plants and arsenals. A significant amount of interface between the MPBMA, ARRCOM, ARRADCOM, Air Force and Navy is necessary to assure integration of the MMT Program into related modernization plans.



ARMAMENT R&D COMMAND
ARMAMENT MATERIEL READINESS COMMAND
(ARRADCOM, ARRCOM)
(AMMUNITION)

<u>CATEGORY</u>	<u>PAGE</u>
Chemical-----	21
Energy Conservation-----	27
Explosives-----	28
Fuzes-----	31
General-----	34
Lap-----	35
Metal Parts-----	43
Pollution Abatement-----	50
Propellants-----	53
Quality Control/Testing-----	58
Safety-----	61
Small Arms-----	63

AMMUNITION PROGRAM

Bridging the technology gap, particularly in those areas that have no civilian counterpart, is a challenging task for the Ammunition MMT Program. In many respects, the Ammunition program presents unique problems which require innovative solutions. Practically all current operations involve a great many hand operations, and methods must be found to efficiently mechanize these. Batch processes must be converted to continuous processes in order to take advantage of new materials handling techniques and to improve the safety of operations.

The primary objective of the Ammunitions Manufacturing Technology Program is to improve existing manufacturing processes, techniques and equipment. The second objective is to bridge the gap between development and full-scale production. The third objective is to solve technological problems identified in the program.

The Manufacturing Methods and Technology effort in the Load, Assemble and Pack area is guided by four major program goals; improved economy of operation, improved safety conditions for operating personnel, establishment of a rapid response production capability, and improvements in the quality of the end product produced. All of these goals must be accomplished within the standards and criteria established for pollution abatement and energy conservation.

Recent changes in policy and guidance have required Process Technology Projects to be cost effective within the timeframe and procurement quantities of the Five Year Defense Plan (FYDP). The challenge of introducing new technology within this guidance is being met by developing systems with the flexibility to produce many items, establishing an optimum balance between system simplicity and process operational requirements, and providing equipment designs capable of high efficiency operation to achieve cost effective system operations.

Due to the inherently hazardous nature of munitions production, an extensive program has been undertaken to upgrade the safety of explosive preparation equipment, loading equipment, and assembly systems. The MMT Program relating to the upgrading of the operational safety of loading lines is a continuation of current efforts. This program will define and investigate specific operational safety hazards, and will develop equipment and systems to reduce operator exposures and risks.

ARRADCOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
CHEMICAL	3796	4140	5036	9735	9145
ENERGY CONSERVATION	1207	1370	1671	1586	4345
EXPLOSIVES	1272	3520	4300	1840	2571
FUZES	1914	0	1075	1697	3365
GENERAL	3951	2960	0	516	970
LAP	4069	7519	4688	4398	6300
METAL PARTS	1367	2356	4092	7560	6217
POLLUTION ABATEMENT	3450	3720	2654	819	0
PROPELLANTS	2772	2739	4277	4335	5555
QUALITY CONTROL/TESTING	2466	1460	1362	1451	3272
SAFETY	1757	2133	850	0	150
SMALL ARMS	1269	1640	3340	4248	4319
	-----	-----	-----	-----	-----
TOTAL	29290	33557	33345	38185	46209

MMT FIVE YEAR PLAN
RCS DRCMT 126

* C A T F G O R Y *

CHEMICAL

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- DECONTAMINATION

(0913) TITLE - SPIN COATING OF DECON AGENT CONTAINERS

337 165

PROBLEM - CURRENT METALLIC DECON AGENT CONTAINERS CORRODE BEFORE THE REQUIRED SHELF LIFE OF THE AGENTS IS REACHED. ALTERNATIVE CONTAINERS ARE NOT AVAILABLE, BUT PLASTIC LINERS HAVE BEEN SHOWN TO EXTEND THE LIFE OF CURRENT CONTAINERS SIGNIFICANTLY.

SOLUTION - ESTABLISH THE SPIN COATING-OR ROTATIONAL MOLDING, TECHNIQUE FOR COATING THE INSIDE OF CURRENT METALLIC CONTAINERS WITH CHEMICALLY RESISTANT POLYMERS FOR THE PRODUCTION ENVIRONMENT.

(2950) TITLE - MFG TECH FOR CLOTHING DECONTAMINATION SYSTEM

600 750

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS ARE BEING IDENTIFIED DURING DEVELOPMENT, UTILIZING PEP FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS MUST BE ACCOMPLISHED TO INSURE ECONOMICAL AND BROAD BASED PRODUCTION

SOLUTION - ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TEST TOOLING DESIGN DATA FOR THE PROCESSES AND/OR COMPONENTRY INVOLVED.

(2951) TITLE - MFG TECH FOR INTERIOR SURFACE DECONTAMINATION SYST

850 850

PROBLEM - PROCESS AND METHODS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS WILL HAVE TO BE ACCOMPLISHED, AS THE BASIS FOR PRODUCTION LINE DESIGN, TO INSURE ECONOMICAL AND BROAD-BASED PRODUCTION.

SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND/OR FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TEST TOOLING DESIGN DATA FOR THE PROCESSES.

(2953) TITLE - MFG TECH FOR RAPID DECONTAMINATION APPARATUS

500

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING DEVELOPMENT, UTILIZING PEP FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS WILL HAVE TO BE ACCOMPLISHED TO INSURE ECONOMICAL AND BROAD BASED PRODUCTION

SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND/OR FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TEST TOOLING DESIGN DATA.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- DETECTION/WARNING

(0904) TITLE - CHEMICAL REMOTE SENSING SYSTEMS

50 1182 2105 659

PROBLEM - FIRST GENERATION CHEMICAL REMOTE SENSING SYSTEMS HAVE HIGH PRIORITY. THEY REQUIRE COMPLEX, UNIQUE, SOPHISTICATED COMPONENTRY WHICH IS NOT AVAILABLE TO MEET PRODUCTION REQUIREMENTS. COMPONENTS WILL BE HAND FABRICATED FOR INITIAL DEVELOPMENT.

SOLUTION - IN ORDER FOR PRODUCTION TO BEGIN AS SOON AS POSSIBLE IT IS NECESSARY THAT APPROPRIATE MANUFACTURING TECHNOLOGY START BEING DEVELOPED NOW. CONTRACTORS WITH NECESSARY EXPERIENCE WILL BE UTILIZED TO ESTABLISH PROCEDURES, ETC. FOR QUANTITY MANUFACTURING.

(2957) TITLE - MFG TECH FOR CML AGENT ALARM, XM22.

800 1000

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING DEVELOPMENT, UTILIZING PEP EFFORT AND FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS WILL HAVE TO BE ACCOMPLISHED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-PROCESS TESTS TOOLING DESIGN DATA.

(2959) TITLE - MFG TECH, AUTOMATIC LIQUID AGENT DETECTOR

500 700

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING DEVELOPMENT, UTILIZING PEP FUNDS. THERE IS A NEED FOR A TECHNIQUE TO COAT THE CIRCULAR GROOVED DISC WITH SILVER FLAKE METALLIC PAINT AND STILL OBTAIN THE RESPONSE TIME REQUIRED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH MINIMUM PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND/OR FABRICATION. PROVIDE DESCRIPTION OF MANUFACTURE AND IN-HOUSE TEST TOOLING DESIGN DATA.

(2961) TITLE - MFG TECH FOR NBC-RECON VEHICLE III

500 1000

PROBLEM - PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AND CRITICAL COMPONENTS WILL HAVE TO BE ESTABLISHED. TWO CRITICAL COMPONENTS ARE THE MICRO-PROCESSOR AND MASS SPECTROMETER.

SOLUTION - MASS PRODUCTION PROCESSES AND TECHNIQUES MUST BE PROVEN OUT. DESCRIPTIONS OF MANUFACTURE WILL BE PREPARED AND IN-PROCESS TOOLING DATA ESTABLISHED.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- FILTERS

(0905) TITLE - MANUFACTURE OF IMPREGNATED CHARCOAL (WHETLERITE)

PROBLEM - ONLY ONE COMPANY (CALGON, INC) SUPPLIES WHETLERIZED CHARCOAL AND CONSIDERS ITS PROCESS PROPRIETARY. THIS MATERIAL IS VITAL FOR NEW PROTECTIVE MASKS. A PROCESS MUST BE DEVELOPED TO DIVERSIFY PRODUCTION BASE AND REDUCE COST THROUGH COMPETITION.

SOLUTION - MMT PROJECT 5 76 1296 DEMONSTRATED THAT, USING DILUTE SOLUTIONS OF IMPREGNANTS AND MULTI-STAGE SOAKING AND DRYING OF CHARCOAL, SEVERAL CHARCOALS SHOWED DRAMATIC PROTECTION IMPROVEMENT. THIS PROJECT WILL USE THESE RESULTS TO ESTABLISH A PROCESS DESIGN

235 256 717

(0907) TITLE - DISPOSABLE AGENT SCRUBBER

79

PROBLEM - ALL EFFLUENTS FROM TEST EQUIPMENT MUST BE COMPLETELY SCRUBBED OF ALL TOXIC MATERIALS. FOR HIGH FLOWS THE LIVES OF STANDARD FILTERS ARE TOO SHORT TO BE ECONOMICAL. CHARCOAL SCRUBBERS MUST BE EMPTIED ONCE A DAY WHICH IS A SERIOUS HAZARD TO THE OPERATOR

SOLUTION - THIS PROJECT WILL DEVELOP A DISPOSABLE SCRUBBER WHICH WILL BE ECONOMICAL AT HIGHEST FLOW RATES. THIS SCRUBBER WILL CONSERVE TEST TIME AND ELIMINATE SAFETY HAZARDS. DESIGN WILL BE AS SIMPLE AS POSSIBLE. CONNECTOR WILL BE LEAK PROOF AND RAPIDLY SET UP.

(0919) TITLE - POLLUTION ABATEMENT FOR WHETERITE CHARCOAL

793

501

PROBLEM - THERE IS NO PROVEN PROCESS FOR THE TREATMENT AND DISPOSAL OF THE EFFLUENTS FROM THE MANUFACTURE OF WHETERIZED CHARCOAL.

SOLUTION - PROVIDE A PROVEN PROCESS TO TREAT AND DISPOSE OF ALL THE WASTES AND EFFLUENTS OF THE MANUFACTURING PROCESS.

COMPONENT -- PROCESSES

(1348) TITLE - SUPER TROPICAL BLEACH

202

561

PROBLEM - THERE IS A MAJOR SHORTFALL BETWEEN THE FY76 REQUIREMENTS FOR THIS ITEM AND THE QUANTITY OF IMPORTED CHLORINATED LIME KNOWN TO BE AVAILABLE.

SOLUTION - THIS PROJECT WILL PROVIDE THE BASIC DESIGN OF A SUPER TROPICAL BLEACH FACILITY. STUDIES WILL INCLUDE POLLUTION ABATEMENT AND CONTROL EQUIPMENT TO ASSURE COMPLIANCE WITH OSHA AND EPA STANDARDS.

(1703) TITLE - HEXACHLOROETHANE RECOVERY/REPROCESSING EVALUATIONS

340

405

PROBLEM - 3 MILLION LB STOCKPILE OF UNSERVICEABLE MUNITIONS CONTAIN 1.41 MILLION LBS. OF HEX. STOCKPILE WILL GROW BY 565,000 POUNDS PER YEAR. DEMIL/DISPOSAL NECESSARY IF HEX IS NOT RECOVERED.

SOLUTION - EXPLOIT EXISTING TECHNOLOGY TO RECOVER HEX FROM STOCKPILE. RECOVERED HEX WILL PROVIDE 46 PERCENT OF HC REQUIREMENT. PROCESS WILL BE USEFUL IN REPROCESSING SUBGRADE PURCHASES AS WELL.

MMT FIVE YEAR PLAN
RCS DRCHT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROCESSES

(CONTINUED)

(2724) TITLE - TECHNOLOGY DATA BASE FOR CR

360

PROBLEM - CX (PHOSGENE OXIME) IS NOT AVAIL COMMERCIALY OR AT GOCO PLANTS TO SUPPORT DEV OF IT'S USE IN THE BINARY IVA MUNITION PROGRAM. THE TECH DATA BASE IS RESTRICTED TO LABORATORY TECHNOLOGY.

SOLUTION - ESTABLISH OPTIMUM PROCESSES AND OPERATIONAL MODES FOR SCALE-UP TO COMMERCIAL OR GOVERNMENT PRODUCTION FACILITIES.

(2725) TITLE - TECHNOLOGY DATA BASE FOR EA4923

305

PROBLEM - THE DATA BASE FOR EA4923 IS RESTRICTED TO LABORATORY DATA. PILOTING DATA IS LACKING AND INFORMATION FOR DESIGNING PRODUCTION FACILITIES DOES NOT EXIST AT THIS TIME.

SOLUTION - TO CONDUCT PROCESS STUDIES IN THE PILOT PLANT TO DETERMINE OPTIMUM OPERATING PARAMETERS AND GENERATE DATA TO SUPPORT THE DESIGN OF A PRODUCTION FACILITY.

(4476) TITLE - MANUFACTURING TECHNIQUES FOR CR (RIOT CONTROL AGENT)

370

PROBLEM - UK PRODUCTION SOURCE NO LONGER EXISTS. THERE IS NO US SOURCE FOR CR AND NO PRODUCTION TECHNIQUE EXISTS WITHIN THE US.

SOLUTION - PROJ IS TO ESTABLISH US PILOT PLANT CAP F/MFG OF CR. EXISTING GENERIC PILOT PLANT WILL BE AUGMENTED BY REQ'D CR PROCESS EQUIP. MFG PROCESS WILL BE FINALIZED. OPERATING PARAMETERS ESTABLISHED, AND A PROOF QTY OF CR PRODUCED.

(4491) TITLE - TECHNOLOGY DATA BASE FOR FINACOLYL ALCOHOL

485

PROBLEM - PINACOLYL ALCOHOL IS NOT CURRENTLY AVAILABLE COMMERCIALY IN PRODUCTION QUANTITIES AND THEREFORE, THE ARMY HAS NO AVAILABLE SUPPLY TO SUPPORT PRODUCTION OF HIGH PRIORITY BINARY IVA CHEMICAL MUNITIONS.

SOLUTION - THIS PROJECT WILL ESTABLISH THE OPTIMUM CHEMICAL PROCESSES AND OPERATIONAL MODES FOR PRODUCTION OF PINACOLYL ALCOHOL AND DEVELOP A TECHNICAL DATA BASE FOR SCALE-UP TO COMMERCIAL OF GOVERNMENT PRODUCTION FACILITIES

(4547) TITLE - PROCESS TECHNOLOGY FOR IR YM76 GRENADE

350

PROBLEM - NEW IR SMOKE SCREENING TECHNOLOGY NEEDED.

SOLUTION - DEVELOP PROCESS TECHNOLOGY FOR FUTURE IPF.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROTECTIVE GEAR

(0909) TITLE - AUTOMATED AGENT PERMEATION TESTER

197 224

PROBLEM - MMT PROJECT 5 75 1314 DEVELOPED INSTRUMENTATION FOR AN IMPROVED PERMEATION TESTER. HOWEVER BECAUSE OF COST (\$5,000 PER TEST UNIT) AN ANTIQUATED METHOD USING FRUIT FLIES IS STILL USED FOR MOST OF THESE TESTS.

SOLUTION - A SYSTEM WILL BE DEVELOPED TO SEQUENTIALLY SAMPLE DATA FROM 10 TESTS AND FEED IT TO ONE TEST UNIT. SAMPLES OF ONE MINUTE EVERY TEN MINUTES WILL BE SUFFICIENT BECAUSE OF LONG TEST PERIODS (8 HOURS OR MORE). FLOW CONTROLS INCLUDE SOLENOID VALVES.

(0912) TITLE - PRODUCTION PROCESS F/PROTECTIVE MASK CANISTER BODIES

474

PROBLEM - THE CURRENT FIVE-STEP DEEP-DRAW PROCESS IS TIME CONSUMING, THE PROCESS HARDENS THE MATERIAL AND MAKES IT SUBJECT TO CRACKING.

SOLUTION - ESTABLISH A PROCESS WHEREBY THE CANISTERS WILL BE FORMED ON A PROGRESSIVE DIE MACHINE.

(0914) TITLE - AUTOMATIC FINISHING OF MASK COMPONENTS

701

PROBLEM - DURING MASK MOLDING OPERATIONS, AN EXCESS OF MATERIAL (FLASH) REMAINS ON THE MOLDED PARTS.

SOLUTION - DEVELOP TUMBLING IN A CRYOGENIC ENVIRONMENT AS AN AUTOMATED PROCESS TO REMOVE FLASH.

(1335) TITLE - MFG TECH FOR NEW PROTECTIVE MASK

2941 1848

PROBLEM - FABRICATION OF ONE-PIECE PLASTIC MASKS WITH ADEQUATE OPTICAL CHARACTERISTICS IS DIFFICULT. VISION REDUCTION AND DISTORTION ARE CRITICAL.

SOLUTION - DEVELOP MANUFACTURING PROCESS TO ALLEVIATE PRODUCTION PROBLEMS DEFINED BY PEP EFFORT.

COMPONENT -- PYROTECHNICS

(P012) TITLE - ADAPTATION OF SLUGGING TECHNOLOGY TO HC SMOKE AND CS RIOT

150

PROBLEM - COLORED SMOKE GRENADE SLUGGING CONCEPT IS NOT ADAPTED TO HC AND RIOT MUNITIONS. CURRENT FILL AND PRESS OPERATIONS ARE LABOR INTENSIVE. INDUSTRIAL HYGIENE IS POOR.

SOLUTION - ADAPT SLUGGING TECHNOLOGY TO HC AND RIOT MIXTURES. IMPROVE INDUSTRIAL HYGIENE.

FUNDING (\$000)

PHIOR 81 82 83 84 85

COMPONENT -- PYROTECHNICS

(CONTINUED)

(P013) TITLE - ADAPTATION OF SLUGGING CONCEPT TO 40MM SMOKE MARKER PDN 280 190

PROBLEM - SMOKE MARKER MUST BE FILLED TO CLOSE TOLERANCES. CURRENT FILL METHODS NEED IMPROVEMENTS. LABOR COSTS ARE HIGH. MAINT. HANDLING IS LABOR INTENSIVE.

SOLUTION - ADAPT SLUGGING TECHNOLOGY FOR AUTOMATED PRODUCTION. REPLACE MANUAL MAINT. HANDLING WITH MECHANICAL SYSTEMS.

(P016) TITLE - SIMULATION OF PBA PYROTECHNIC PRODUCTION LINES 100 100

PROBLEM - MULTI-PURPOSE LINES. SHORT DURATION PRODUCTION RUNS.

SOLUTION - PROVIDE SIMULATION SOFTWARE. MONITOR PRODUCTION PROCESSES. PROVIDE STATE OF READINESS.

(P020) TITLE - INCENDIARY MIX STUDY 520

PROBLEM - TECHNOLOGY OUTDATED. FACILITIES OLD AND LABOR INTENSIVE. HEAVY POLLUTANT.

SOLUTION - PERFORM STUDY TO PROVIDE UPDATED EQUIPMENT. PROVIDE STATE OF ART TECHNOLOGY. LIMIT POLLUTION FROM PLANT.

(1347) TITLE - ADVANCED TECH FOR MANUFACTURE OF RED PHOSPHORUS 300 800

PROBLEM - THERE IS A HIGH TRADOC PRIORITY FOR A FAMILY OF NEW SMOKE MUNITIONS. THE L8A1 DOES CONTAIN RED PHOSPHORUS AND THE 155MM AND THE 105MM ARE POSSIBLE CANDIDATES FOR IT. HOWEVER, RED PHOSPHORUS IS NOT PRODUCED IN THE U.S..

SOLUTION - IN ORDER TO HAVE AN ADEQUATE MOBILIZATION SUPPLY OF RP, DEVELOP THE TECHNOLOGY REQUIRED TO DESIGN A RED PHOSPHORUS FACILITY.

(1709) TITLE - IMPR PROCESSING OF STARTER MIX FOR PYROTECHNIC MUNITIONS 1000 200

PROBLEM - ACCIDENTAL INVITATION OF MIXTURES DURING PROCESSING IS A SERIOUS PERSONNEL SAFETY PROBLEM DUE TO EXPOSURE TO FIRE AND EXPLOSIVE HAZARDS.

SOLUTION - EVALUATE NEW MIXING AND HANDLING TECHNOLOGY THAT WILL MINIMIZE EXPOSURE TO SAFE AND TOXIC MATERIALS.

(3710) TITLE - PROTOTYPE PROCESS EQUIPMENT FOR 40MM, CS, M651 300

PROBLEM - CURRENT PRODUCTION FACILITIES EXIST ONLY IN PRIVATE INDUSTRY. THIS MUNITION WILL NOW BE PRODUCED IN GGGO FACILITY FOR MOB PURPOSES. CURRENT PROCESS REQUIRES IMPROVEMENTS FOR OSHA/EPA STANDARDS.

SOLUTION - THERE IS CURRENTLY A FACILITY FOR PRODUCTION OF THE 40MM RED, YELLOW, AND GREEN COLORED SMOKE MARKER. THE TECHNOLOGY NEEDED TO CONVERT AND MODIFY THIS FACILITY TO INCLUDE PRODUCTION OF THE 40MM, CS, M651 CARTRIDGE IS TO BE DEVELOPED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PYROTECHNICS

(CONTINUED)

(4161) TITLE - PROC TECH FOR PDN OF 81 MM IMPRV SMOKE MUN

476

PROBLEM - A REQUIREMENT EXISTS FOR APPLYING THE IMPROVED SMOKE CONCEPT TO FILLING THE WARHEAD FOR THE 81 MM MORTAR.

SOLUTION - CONDUCT PROCESSING TECHNIQUE STUDIES FOR PREMIX, FILL, CLOSE AND LAP MINITIONS PRODUCTION PROCESS DATA.

(4417) TITLE - USE OF RED PHOSPHORUS IN SMOKE POT APPLICATIONS

115 165

PROBLEM - SMOKE PRODUCED FROM HC HAS LED TO SOME INJURIES AND IS SUSPECTED OF BEING A CARCINOGEN. R+D WORK IS BEING DONE TO DEVELOP A RED PHOSPHORUS MIX TO REPLACE HC. HOWEVER NO LARGE SCALE RP PREPARATION FACILITIES CURRENTLY EXIST.

SOLUTION - DEVELOP THE TECHNOLOGY AND ESTABLISH A PROTOTYPE FACILITY WHICH WILL ON A LARGE SCALE PREPARE FOR LOADING THE RP FORMULATION WHICH IS DEVELOPED IN R+D

(4548) TITLE - SAFETY IMPROVEMENTS OF PYROTECHNIC MIXING

1000

PROBLEM - PYROTECHNIC MIXING REQUIRES INCREASED PERSONNEL SAFETY FEATURES.

SOLUTION - EVALUATE CURRENT PROCESS AND INCREASE OPERATOR SAFETY THROUGH ADAPTION OF PROCESS CHANGES.

* C A T E G O R Y *

*ENERGY CONSERVATION *

COMPONENT -- GENERAL

(2718) TITLE - UTILIZATION OF HEAT GENERATED IN TNT MANUFACTURE

470

PROBLEM - NO EFFECTIVE USE IS BEING MADE OF THE HEAT REMOVED BY COOLING WATER DURING THE NITRATION STAGES IN THE MANUFACTURE OF TNT.

SOLUTION - INSTALL HEAT TRANSFER EQUIPMENT TO RECOVER THE HEAT GENERATED BY THE NITRATION REACTIONS FOR USE IN THE TNT PURIFICATION OPERATIONS.

(2722) TITLE - HEAT RECOVERY FROM CYCLOHEXANONE VAPOR

405

PROBLEM - CRUDE RDX OR HMX IS DISSOLVED IN WATER/CYCLOHEXANONE SOLUTION W/AID OF STEAM HEAT. IT IS THEN RECRYSTAL TO OBTAIN DESIRED CRYSTALLINE SIZE + CONFIG BY EVAP CYCLOHEXANONE. CYCLOHEXANONE VAPOR CONDENSED BY COOLING WATER. PROCESS IS ENERGY INTENSIVE.

SOLUTION - THIS PROJ INVOLVES USE OF HEAT AVAIL FROM THE CYCLOHEXANONE VAPOR TO ACHIEVE DISSOLUTION OF THE RDX/HMX CRYSTALS + THEREBY REDUCE THE REQUIREMENT FOR STEAM.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL (CONTINUED)

(2740) TITLE - CAD OF AAP'S BASED ON ENERGY CONSIDERATIONS 405

PROBLEM - ADAPT NECAP (NASA ENERGY COST ANALYSIS PROGRAM) TO ACCOUNT FOR THE UNIQUE DESIGN FEATURES OF AAP'S.

SOLUTION - NECAP IS A PROGRAM FOR DETERMINING BUILDING DESIGN COST EFFECTIVENESS BASED ON ENERGY CONSIDERATIONS. MUST BE ADAPTED TO THE UNIQUE DESIGN FEATURES FOUND IN AAP'S.

(3714) TITLE - ALTERNATIVE AZEOTROPIC SOLVENT FOR ACETIC ACID CONCENTRATION 335

PROBLEM - CURRENT ACETIC ACID CONCENTRATION PROCESS AT HSAAP USES N-PROPYL ACETATE AS AN EXTRACTING AGENT TO REMOVE WATER FROM THE ACETIC ACID. THE CURRENT PROCESS USES VERY LARGE QUANTITY OF ENERGY FOR THIS PROCESS

SOLUTION - REPLACE THE N-PROPYL ACETATE WITH N-BUTYL ACETATE. N-BUTYL ACETATE IS A MUCH MORE EFFICIENT AZEOTROPIC AGENT THAN N-PROPYL ACETATE.

(4261) TITLE - CONSERVATION OF ENERGY AT AAP'S 5439 1207 1370 1671 1586 2190

PROBLEM - PETROLEUM MAY NOT BE AVAILABLE IN FUTURE TO MEET PRODUCTION REQUIREMENTS.

SOLUTION - DEVELOP ENERGY SAVING TECHNOLOGY TO APPLY TO AAP MANUFACTURING FUNCTIONS TO REDUCE QUANTITY OF ENERGY USED AT ALL LEVELS OF PRODUCTION.

(4461) TITLE - PYROLYSIS OF AAP WASTE 100 540

PROBLEM - WASTE IS DESTROYED WITHOUT RECOVERY OF ENERGY.

SOLUTION - RECOVER ENERGY FROM WASTE.

* CATEGORY *

*EXPLOSIVES *

COMPONENT -- COMP B

(4267) TITLE - CONTINUOUS PROCESS FOR GRANULAR COMPOSITION B 831 743 850

PROBLEM - THE BATCHWISE COOLING PROCESS OF RDX/TNT/WAX SLURRY ALLOWS ONLY A LIMITED CONTROL OF GRANULATION.

SOLUTION - DEVELOP AND USE A CONTINUOUS PROCESS TO PRODUCE GRANULAR COMPOSITION B.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- HMX/RDX

(4404) TITLE - IMPROVE RECOVERY OF ACETIC ACID IN RDX MANUFACTURING

PROBLEM - FORMIC ACID IN THE "A" AREA AZEO STILL AT HSAAP CAUSES PROBLEMS. FIRST THE STILL MUST BE MADE OF HASTALLOY VS STAINLESS AND SIDE REACTIONS CAUSE STEAM USAGE TO GO UP 140 PERCENT AND THE ENTRAINER TO BE REPLACED TWICE A YEAR.

SOLUTION - NEUTRALIZE THE FORMIC ACID PRIOR TO ITS INTRODUCTION TO THE AZEO STILL.

246 162

(4406) TITLE - IMPROVE YIELD OF HMX DURING RDX NITROLYSIS

PROBLEM - THE CURRENT MANUFACTURING PROCESS FOR HMX IS INEFFICIENT IN THAT YIELDS OBTAINED ARE STILL LESS THAN THEORETICAL.

SOLUTION - THE CURRENT BACHMANN PROCESS WILL BE MODIFIED TO INCREASE THE HMX YIELD BEYOND 30 PERCENT.

633 642

(4449) TITLE - PROCESS IMPROVEMENT FOR COMPOSITION C-4

PROBLEM - THE EXISTING FACILITIES WHICH ARE COMMON TO THE MANUFACTURE OF COMP B AND THE OTHER RDX COMPOSITION WOULD LIMIT THE AVAILABILITY OF THESE ITEMS BELOW THEIR MOB REQUIREMENTS.

SOLUTION - ESTABLISH NEW PROCESSES AND METHODS FOR THE MANUFACTURE OF THESE ITEMS TO MINIMIZE THE IMPACT OF COMMON OPERATIONS ON CAPACITY.

897 339 520

(4515) TITLE - HEXAMINE MANUFACTURING AND SOLUTION PREPARATION

PROBLEM - THERE IS INSUFFICIENT SUPPLY OF HEXAMINE TO PRODUCE RDX AND HMX MOBILIZATION REQUIREMENTS. MUCH OF THE TECHNOLOGY IS AVAILABLE TO PERMIT MANUFACTURE ON-SITE. THE PREPARATION OF AN ACETIC ACID-HEXAMINE SOLUTION FROM AQUEOUS HEXAMINE REQUIRES STUDY.

135

SOLUTION - VERIFY DISTILLATION ASSUMPTIONS ON BENCH SCALE PRIOR TO PROCEEDING WITH FULL-SCALE DESIGN.

(4525) TITLE - PRODUCTION OF HMX FROM A MODIFIED RDX PROCESS

PROBLEM - HMX IS CURRENTLY BEING PRODUCED AT A RATE OF 1/9 OF RDX. THIS HAS CONTRIBUTED TO THE HIGH PRODUCTION COST OF HMX.

250 505 405

SOLUTION - MODIFIED A CONTINUOUS RDX REACTOR AND VARY THE REACTION PARAMETERS TO PRODUCE HMX AT A MUCH EXPANDED PRODUCTION RATE (AT LEAST TWO TO FOURFOLD).

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROCESS CONTROL
(1905) TITLE - PBX CONTINUOUS CAST FOR MUNITION LOADING 250 1065

PROBLEM - ADDED USE OF CASTABLE PLASTIC BONDED EXPLOSIVES WILL CREATE PRODUCTION SHORTFALLS. MOST PBX CAN NOT BE USED IN PRESENT MELT / CAST EQUIPMENT. PBX PRODUCTION IS NOW DONE AT 2 NAVY PLANTS WHICH COULD NOT HANDLE LOADING OF CASTABLE PBX IN BOMBS.
SOLUTION - ESTABLISH HIGH PRODUCTION RATE CONTINUOUS PROCESSES FOR MIX AND CAST OF VARIOUS PBX FORMULATIONS. IDENTIFY + EVALUATE EQUIPMENT + PROCESSES, SELECT + TEST EQUIPMENT + INTEGRATE ACCEPTABLE ITEMS INTO AN OPERATING PBX PROCESSING PILOT PLANT.

(3708) TITLE - PROCESS FOR MANUFACTURE OF ETHYLENE DIAMINE DINITRATE (EDAN) 300 550

PROBLEM - NO PROBLEM PROVIDED.
SOLUTION - NO SOLUTION PROVIDED.

COMPONENT -- TNT

(1500) TITLE - EVAL INDUST CAPABILITY F/LOAD COMMERCIAL EXPL-HIGH USE MUNIT 473 450 1200

PROBLEM - DURING MOBILIZATION THERE CAN BE A SHORT FALL IN AVAILABILITY OF MILITARY EXPLOSIVES. INDUSTRY HAS MANY SAFE EXPLOSIVE FORMULATIONS. THEIR APPLICABILITY TO MILITARY USAGE IS UNKNOWN. INDUSTRIAL CAPABILITY FOR MILITARY FILLING THESE EXPL IS UNKNOWN.

SOLUTION - CONDUCT A PROGRAM TO IDENTIFY THE QUANTITIES AND TYPES OF COMMERCIALLY AVAILABLE EXPLOSIVES THAT COULD BE USED TO SUPPLEMENT THE ARMY'S PRODUCTION CAPABILITIES DURING EMERGENCY PRODUCTION PERIODS. EVALUATE THE PERFORMANCE OF MUNITIONS PRODUCED THIS WAY

(4200) TITLE - TNT CRYSTALLIZER FOR LARGE CALIBER 29 302 488

PROBLEM - TNT MELT LOADING REQUIRES AN OPTIMUM RATIO OF MOLTEN AND SOLID TNT IN THE EXPLOSIVE MIX AT THE TIME OF POUR. THE RATIO IS OBTAINED BY THE ADDITION OF FLAKE TNT TO A QUANTITY OF MOLTEN TNT BASED ON OPERATOR JUDGEMENT.

SOLUTION - DEV A DEVICE WHICH UTILIZES MOLTEN TNT TO GEN A SLURRY CONSISTENCY THROUGH PARTIAL CONTROLLED, STEADY-STATE CRYSTALLIZATION. BY CLOSE CONTROL OF TNT FLOW RATE AND THERMAL PARAMETERS, A CONTINUOUS FINE GRAINED SLURRY MIX OF PROPER RATIO WOULD RESULT.

(4237) TITLE - CONTINUOUS TNT PROCESS ENGINEERING 2486 400 960

PROBLEM - CURRENT CIL PROCESS REQUIRES PROCESS AND SAFETY IMPROVEMENTS.
SOLUTION - DESIGN AND BUILD A CIL LINE TO TEST PROCESS IMPROVEMENTS.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TNT

(CONTINUED)

(4399) TITLE - INSTRU IN-PROCESS MEASUREMENTS OF SOLID LIQUID TNT

158 163

PROBLEM - NO ACCURATE REAL TIME CAPABILITY EXISTS TO MEASURE THE SOLID/LIQUID RATIO OF TNT SLURRIES CRITICAL FOR TNT LOADING OF MEDIUM AND LARGE CALIBER PROJECTILES. THIS RESULTS IN MARGINAL PROCESS CONTROL WITH A POTENTIAL FOR DEFECTIVE CASTS AND REWORK.

SOLUTION - DEVELOP REMOTELY OPERATED HIGHLY SENSITIVE INSTRUMENTATION TO MEASURE SLURRY SOLID/LIQUID PROPORTION DURING TNT LOADING OPERATIONS. THIS WILL PERMIT CLOSE CONTROL OF THE TNT PHYSICAL CHARACTERISTICS AND RESULT IN THE HIGHEST UNIFORM QUALITY POSSIBLE

(4452) TITLE - REPROCESSING DEMILLED EXPLOSIVES

141

PROBLEM - LARGE QUANTITIES OF EXPLOSIVES FROM DEMILITARIZATION ARE DESTROYED ANNUALLY, PRIMARILY BY BURNING BECAUSE NO ESTABLISHED METHOD IS AVAILABLE FOR REPROCESSING THE MATERIAL FOR REUSE IN MUNITIONS LOADING.

SOLUTION - DEVELOP PROTOTYPE EQUIPMENT FOR REPROCESSING/REFINING RECLAIMED EXPLOSIVES, ANALYZE THE QUALITY, ENERGY POTENTIAL, AND LOADING RESULTS OF P RECLAIMED EXPLOSIVES USED ALONE OR AS A MIXTURE WITH VIRGIN MATERIAL.

(4527) TITLE - AUTOMATED FLAMER MOLTEN TNT DETECTOR

200

PROBLEM - WHEN TNT DOES NOT SOLIDIFY ON FLAKER DRUM IT FALLS INTO HOPPER WHERE IT SOLIDIFIES AND STOPS THE FLOW OF TNT FLAKES. OPERATIONS MUST BE STOPPED UNTIL THE HAZARDOUS REMOVAL OF TNT FROM HOPPER BY REMING OR RAPPING IS COMPLETED.

SOLUTION - A MOLTEN TNT DETECTOR WILL BE DEVELOPED TO DETECT PRESENCE OF MOLTEN TNT ON FLAKER DRUM AND STOP THE FLAKING OPERATION. THIS WILL PREVENT MOLTEN TNT FROM ENTERING THE HOPPER.

* C A T E G O R Y *

*FUZES *

COMPONENT -- ELECTRONICS

(L222) TITLE - BORESIGHTING OF SFF WHD W/IR SENSOR

200

PROBLEM - NO PRODUCTION PROCESS EXISTS TO BORE SIGHT STORM WARHEAD TO IR SENSOR. PRESENT HAND PROCESS REQUIRES SEVERAL HOURS AND IS UNRELIABLE.

SOLUTION - DEVELOP EQUIPMENT TO AUTOMATE PROCESS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

(CONTINUED)

COMPONENT -- ELECTRONICS

(3716) TITLE - SENSOR TECHNOLOGY

1000

PROBLEM - REPLACE CONVENTIONAL (AND COMPLEX) FUZES WITH OPTICAL SENSING DEVICES.

SOLUTION - THIS TECHNOLOGY (SENSOR) WILL BE HIGHLY AUTOMATED IN PRODUCTION AND HIGHLY ACCURATE IN USE (COMMERCIAL APPLICATIONS WILL BE NUMEROUS IN THIS TIME SPAN).

COMPONENT -- LAP

(4521) TITLE - MOD M223 FUZE PACK OUT

800

PROBLEM - MMT PROJ CURRENTLY UNDER CONTRACT TO AUTO ASSEMBLE M223 FUZE AT MINIMUM RATE OF 90 ASSEMBLIES PER MINUTE. MANUAL PACKOUT OF M223 FUZES INTO SHIP + STORAGE CONTAINERS AT HIGH PROD RATE WOULD BE A HIGH LABOR INTENSIVE OPR. UP TO 500 ASSEMBLIES PER MINUTE

SOLUTION - DEVELOP AN AUTOMATED PACK OUT LINE TO MATE WITH THE AUTOMATIC ASSEMBLY EQUIPMENT.

COMPONENT -- METAL PARTS

(2735) TITLE - POWDER METALLURGY FUZE COMPONENTS

300 170

PROBLEM - MACHINING FUZE METAL PARTS FROM BAR STOCK IS TIME CONSUMING + GENERATES A LARGE AMOUNT OF SCRAP. THERE IS A NEED TO DEV ALTERNATE PROCESS FOR FABRICATING FUZE PARTS THAT ARE MACHINED FROM BAR STOCK.

SOLUTION - DEVELOP ALTERNATE PROCESSES FOR FABRICATING FUZE PARTS THAT ARE MACHINED FROM BAR STOCK.

(2736) TITLE - CHEMICAL MACHINING OF PRECISION COMPONENTS

120

PROBLEM - HOLDING TOLERANCES AND HIGH SCRAP RATES ARE COMMON PROBLEMS WHEN SMALL THIN FUZE PARTS ARE STAMPED IN A PRESS. STAMPING IS CAPITAL INTENSIVE AND IS ONLY GOOD FOR VERY HIGH VOLUME QUANTITIES.

SOLUTION - CHEMICAL MACHINING OF COMPONENTS REQUIRES LESS CAPITAL EQUIPMENT AND PRODUCES A MUCH SMALLER QUANTITY OF SCRAP.

(4401) TITLE - HOT FORMING + COLD HEADING LARGE FUZE COMPONENTS

288 275

PROBLEM - MULTISPINDLE BAR MACHINES DATE FROM 1950'S. THEY HAVE LOW PRODUCTIVITY, DO NOT MEET DSHA, CAN'T USE CARBIDE TOOLS, NO SPARE PARTS.

SOLUTION - APPLY MOD TECH SUCH AS HOT FORGE AND COLD HEADING TO OBTAIN SHAPE + REDUCE MACHINING AND SCRAP. THIS ALLOWS HIGH SPEED CHUCKERS FOR FINISH MACHINING.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- METAL PARTS

(CONTINUED)

(4402) TITLE - HSS PRECISION GEAR HOBBS

447 1000

PROBLEM - THE FUZE PRODUCTION BASE UTILIZES SOLID CARBIDE HOBBS FOR MFG PINIONS. THERE IS NO DOMESTIC MFR OF THESE HOB. THEY ARE IMPORTED FROM FOREIGN SOURCES. LEAD TIME IS 10 TO 18 WEEKS. A SURVEY SHOWED A LACK OF TECH, SKILLS + INTEREST IN MFG.

SOLUTION - DEVELOP IMPROVED HIGH SPEED STEEL HOBBS USING HIGH STRENGTH STEEL TO IMPROVE WEAR LIFE AND PROVIDE A BACKUP FOR MOB AND LEADTIME RED UCTION USING U.S. AVAILABLE TECHNOLOGY.

(4434) TITLE - MFG, TEST, AND INSP EQPT F/XM763, 105MM FUZE

450 475

PROBLEM - NO PROBLEM PROVIDED.

SOLUTION - NO SOLUTION PROVIDED.

COMPONENT -- POWER SUPPLIES

(1001) TITLE - PILOT LINE FOR FUZE FLUIDIC POWER SUPPLIES

253 315

PROBLEM - FLUIDIC GENERATORS ARE COMPLEX AND COSTLY TO PRODUCE. IN PRODUCTION, CLOSE TOLERANCES AND SMALL PART ASSEMBLY ARE REFLECTED IN HIGH COST AND LOW YIELD.

SOLUTION - IDENTIFY AND ADOPT THE MOST ECONOMICAL MFG PROCESSES AND TECHNIQUES TO ESTABLISH A MECHANIZED PILOT LINE FOR ASSEMBLY OF FLUIDIC POWER SUPPLIES.

(4266) TITLE - MANUFACTURING, INSPECTION AND TEST EQUIP FOR MAG PWR SUPPLY

345 759

PROBLEM - PIEZOELECTRIC POWER SUPPLIES USED IN HEAT AMMO HAVE UNDESIRABLE VOLTAGE GENERATION IMPRESSED ON THE ELECTRICAL CIRCUITS OF THE ROUND DUE TO SHOCK VIBRATIONS RESULTING DURING FLIGHT WHICH MAY CAUSE PREMATURES.

SOLUTION - MOVE THE POWER SUPPLY FROM THE NOSE OF THE ROUND TO INSIDE THE PIBD FUZE HOUSING AND CHANGE IT TO A MAGNETIC PULSE GENERATING TYPE POWER SUPPLY WHICH IS UNAFFECTED BY THE PROBLEM OF SHOCK VIBRATIONS.

COMPONENT -- QA/TESTING

(D024) TITLE - IN PROCESS INSPECTION OF ENCAPSULANT MATERIAL

300

PROBLEM - PROCESS TECHNOLOGY FOR PLASTIC ENCAPSULANTS WAS DEVELOPED UNDER 578 3907 HOWEVER INSPECTION TECHNIQUES FOR THOSE ENCAPSULANTS WERE NOT DEVELOPED

SOLUTION - DEVELOP A NON DESTRUCTIVE INSPECTION TECHNIQUE TO DETERMINE IF VOIDS EXIST IN THE MATERIAL. THIS WILL INCREASE YIELDS AS WELL AS PROVIDE 100% INSPECTION CAPABILITY.

COMPONENT -- QA/TESTING

(CONTINUED)

(2739) TITLE - TEST EQPT AND PROCESSES FOR XM762 ELECTRONIC FUZE

PROBLEM - THERE IS A NEED FOR THE EQUIPMENT AND PROCESSES THAT CAN PROVIDE PRODUCTION TESTING OF FUZE ASSEMBLIES AT THE MOBILIZATION PRODUCTION RATE.

SOLUTION - THE GOAL OF THIS PROJECT IS TO DEVELOP TESTING APPROACHES AND DESIGN EQUIPMENT WHICH CAN PROVIDE PRODUCTION TESTING OF FUZE COMPONENTS AND ASSEMBLIES AT THE MOBILIZATION PRODUCTION RATE.

(3961) TITLE - IMPROVE (3-D) VIBRATION ACCEPT TEST F/M732 M724

PROBLEM - CURRENT METHODS ARE COSTLY AND TIME CONSUMING. RARELY EXPOSE THE TEST ITEM TO TRUE SERVICE ENVIRONMENTS, AND REQUIRE THREE TESTS TO ACCOUNT FOR ALL TEST AXES.

SOLUTION - USE OF COMPUTERIZED 3-D VIBRATION / SHOCK TESTING AS AN ACCEPTANCE TOOL SOLVES TECHNICAL + ECONOMIC TEST DEFICIENCIES. TEST TIME IS REDUCED

(4360) TITLE - HIGH SPEED DIMENSIONAL INSP OF FUZE COMF

PROBLEM - FUZE PRECISION PLATES ARE INSPECTED BY SAMPLING AND MANUAL METHODS.

SOLUTION - PROVIDE 100 PERCENT HIGH SPEED AUTOMATED INSPECTION PRODUCTION. TRENDS CAN BE RECORDED FOR PROCESS CONTROL.

* C A T E G O R Y *

* GENERAL *

COMPONENT -- MISCELLANEOUS

(L203) TITLE - INSP + TEST EQUIP FOR CONDUCTIVE MIX DETONATOR

PROBLEM - CONDUCTIVE MIX TYPE DETONATORS HAVE NOT BEEN FABRICATED IN PRODUCTION QUANTITIES.

SOLUTION - A US VERSION OF THE GERMAN CONDUCTIVE MIX DETONATOR WILL BE FABRICATED USING THE LATEST TECHNIQUES. THE PROJECT WILL PROVIDE THE MECHANIZATION NEEDED FOR INCREASED SAFETY AS WELL AS INCREASED PRODUCTION AT A LOWER COST.

(L223) TITLE - FOAM IN PLACE MUNITION BODY F/XM84

PROBLEM - DEVELOP PROCESS TO ENCAPSULATE MAJOR MUNITION COMPONENTS WHERE INTERNAL STRESSES WOULD BE MINIMIZED, PREALIGNMENTS OF ELEMENTS WOULD NOT BE DISTURBED AND EXOTHERM WOULD BE COMPATIBLE WITH EXPLOSIVES AND OTHER TEMPERATURE SENSITIVE COMPONENTS.

SOLUTION - DETERMINE OPTIMUM COMBINATION OF FOAM IN-PLACE MATERIALS AND COMPONENT ALIGNMENT PROCESS TO ALLOW FOR ENCAPSULATION OF INTERNAL COMPONENTS FOR XM84.

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(2742) TITLE - LASER APPLIED DURABLE COATINGS

150 200

PROBLEM - PRODUCTIVITY IS A FUNCTION OF RAM TO INCREASE RELIABILITY AND
REDUCE MAINTENANCE DOWNTIME AND COST IN THE MUNITIONS PLANT ENVIRONMENT IS
VERY DIFFICULT.

SOLUTION - UTILIZE LASER APPLIED DURABLE COATINGS ON MACHINE AND TOOL WEAR
SURFACES AND IN CORROSIVE ENVIRONMENTS.

(4309) TITLE - PROCESS DEVEL F/120MM AMMO

4622 3951 2960

PROBLEM - MASS PRODUCTION IN THE US OF W. GERMAN 120MM TANK AMMUNITION POSES
PROBLEMS IN FOUR FUNCTIONAL AREAS - METAL PARTS, PROPELLANT, FUZE, AND LAP.

SOLUTION - THIS IS A MULTI-YEAR EFFORT IN FOUR FUNCTIONAL AREAS. A SEPARATE
TASK ADDRESSES EACH UNIQUE PROBLEM. THIS MMT SUPPORTS FACILITY PROJECTS IN
FY83-84 AND IS ESSENTIAL TO FIELDING THE 120MM GUN SYSTEM ON THE M1 TANK IN
FY85.

(6736) TITLE - TECH READINESS ACCEL THRU COMPUTE INTEGRATED MFG (TRACIM)

871 266

PROBLEM - THE LEAD TIME REQUIRED TO BRING PRODUCTION LINES TO MOBILIZATION
MAXIMUM IS INTOLERABLY EXCESSIVE. A CRITICAL DETERRENT IS THE EXTREME
SHORTAGE OF TOOLMAKERS AND MACHINISTS.

SOLUTION - THE DEVELOPMENT AND IMPLEMENTATION OF A COMPUTER INTEGRATED
MANUFACTURING SYSTEM WILL SIGNIFICANTLY REDUCE THE REQUIREMENT FOR HIGHLY
SKILLED CRAFTSMEN.

* C A T E G O R Y *

* LAP *

COMPONENT -- ASSEMBLY

(D030) TITLE - LAP OF SENSE AND DESTROY ARMOR (SADARM)

950

PROBLEM - SADARM COMPONENTS ARE COSTLY TO LAP. NO ECONOMICAL PRODUCTION
SYSTEM EXISTS.

SOLUTION - DEVELOP ECONOMICAL METHODS FOR LAP OF SADARM COMPONENTS.

(2700) TITLE - LAP CENTER CORE PROPELLING CHARGES

150

PROBLEM - TACK SEWING END SEAMS OF BASE IGNITER ASSEMBLY + BODY ASSEMBLY
REQUIRES NEW SEW MACHINE APPROACH/TECHNIQUE. THIS IS REQUIRED TO REDUCE
COSTS BY REDUCING NUMBER OF PERSONNEL NEEDED TO PERFORM SEWING OPERATIONS.

SOLUTION - EVALUATE CURRENT STATE-OF-THE-ART SEWING MACHINE TECHNIQUES TO
INCORPORATE A METHOD COMPATIBLE WITH AUTOMATED LAP EQUIPMENT. BUILD A
MOCK-UP OF THE SEWING STATION.

COMPONENT -- ASSEMBLY

(CONTINUED)

(2706) TITLE - AUTOMATIC PROCESSING OF PARACHUTE ASSEMBLIES

215

PROBLEM - PARACHUTE ASSEMBLY AT PRESENT IS AN OPERATOR CONTROLLED PROCESS DEVELOPED FROM HAND FOLDING OF MANNED PARACHUTES. THIS IS A TIME CONSUMING AND COSTLY PROCESS REQUIRING EXPERIENCE AND DEXTEROUS PERSONNEL.

SOLUTION - UTILIZING FAVORABLE RESULTS OF PRIOR YEAR FEASIBILITY STUDIES, BUILD AND TEST A FULL SCALE PROTOTYPE SYSTEM FOR ECONOMICAL, RELIABLE, HIGH-RATE, SEMI-AUTOMATIC ASSEMBLY OF PARACHUTE COMPONENTS FOR AMMUNITION ITEMS.

(2710) TITLE - MODIFICATION OF LINE F/LAP OF UK PROPELLING CHARGE

700

PROBLEM - HAND LINE LOADING/ASSEMBLY OF UK CHARGE WHEN ADOPTED WOULD BE REQUIRED WITH THE RESULTING HIGH COST, GREATER EXPOSURE OF PERSONNEL TO FLAMMABLE/EXPLOSIVE MATERIALS AND LESS RELIABLE PRODUCT.

SOLUTION - DEVELOP TOOLING/EQUIPMENT MODIFICATION REQUIREMENTS FOR AUTOMATICALLY LOADING/ASSEMBLING UK CHARGE ON THE AUTOMATED LAP LINE FOR US M204/M205 PROPELLING CHARGE.

(2713) TITLE - CLOSURE/SEALING TECH FOR XM131/XM132 DISPENSER

170

PROBLEM - THE HOT GAS WELD TECHNIQUE USED TO SEAL THE MOPMS DISPENSER COVERS IS TIME CONSUMING AND ITS QUALITY IS HIGHLY DEPENDENT ON OPERATOR SKILLS.

SOLUTION - ALT SEALING/CLOSURE TECH SUCH AS ULTRASONIC WELDING, INDUCTION WELDING, HOT WIRE WELDING WILL BE INVESTIGATED. SEALING/CLOSURE EQUIP WILL BE DESIGNED TO MECHANIZE OR AUTOMATE CLOSURE + SEALING OPRS.

(3011) TITLE - AUTO ASSY OF M21 FLASH SIMULATOR

900

PROBLEM - ITEM IS BEING MANUFACTURED IN WEST GERMANY F/US. CURRENT PLAN FOR PROCUREMENT IN US WOULD RESULT IN LABOR INTENSIVE OPERATION CURRENTLY PLANNED F/LONGHORN AAP.

SOLUTION - THE MMT WILL PROVIDE AN AUTOMATED ASSEMBLY LINE WHICH WILL REDUCE THE LABOR REQUIRED FOR ITEM PRODUCTION.

(4000) TITLE - AUTO M55 DETONATOR PRODUCTION EQUIPMENT

6712 604

PROBLEM - LAP OF DETONATORS IS LABOR INTENSIVE. PERSONNEL EXPOSURE IS EXTENSIVE. MOB RATES ARE EXTREMELY HIGH.

SOLUTION - DEVELOP AN AUTOMATED SYSTEM FOR PRODUCTION OF NON-ELECTRIC DETONATORS TO PRODUCE HIGH QUALITY DETONATORS WITH REDUCED COST AND IMPROVED SAFETY.

(4062) TITLE - AUTO MFG SUPPORT FOR MORTAR INCREMENT CONTAINERS

1391 1693 1411

PROBLEM - THE MANUFACTURE AND ASSEMBLY OF THE 60/81MM PROP CHARGE INCREMENT CONTAINER IS LABOR INTENSIVE AND DOES NOT MEET PRODUCTION REQUIREMENTS.

SOLUTION - DEVELOP PROCESS AND EQUIPMENT TO REDUCE COSTS, INCREASE PRODUCTION RATES, AND IMPROVE QUALITY.

COMPONENT -- ASSEMBLY

(CONTINUED)

(4138) TITLE - EQUIPMENT FOR AUTO PROCESSING OF ADDITIVE LINER

371

PROBLEM - PIP IS BEING EXECUTED TO ELIMINATE THE SEWING OF THE PROTECTIVE FILM TO ADDITION LINERS. ANOTHER TASK IS THE DEV OF AN ABLATIVE TYPE WEAR REDUCER (SILICON GREASE BAGGED IN MYLAR FILM) MFG EQUIP IS REQUIRED F/EITHER GUN TUBE WEAR REDUCER.

SOLUTION - AUTOMATED EQUIPMENT WILL BE DEVELOPED IN THE CASE OF SEWING ELIMINATION OF THE MYLAR FILM. AUTOMATED EQUIPMENT WILL BE DEVELOPED FOR METERING AND PACKAGING THE NEW ABLATIVE TYPE GUN TUBE WEAR REDUCER.

(4198) TITLE - AUTOMATED LAP OF STICK-PROPELLANT CHARGES

1030

PROBLEM - STICK PROPELLANT CHARGES HAVE NO LAP PROCESSING PRECEDENT. CURRENT MANUAL METHODS OF PRODUCTION ARE INEFFECTIVE IN ACHIEVING SATISFACTORY LEVELS OF QUALITY. COST, SAFETY AND PRODUCTION READINESS.

SOLUTION - EFFICIENT HIGH SPEED AUTO LAP EQUIPMENT WILL BRING PRODUCTION OF STICK PROPELLANT CHARGES TO A LEVEL CONSISTENT WITH MODERN TECHNOLOGY. AN INITIAL ENGINEERING STUDY TO DEFINE CONCEPTS AND PARAMETERS TO BE FOLLOWED BY PROTOTYPE EQUIPMENT IS PROPOSED.

(4311) TITLE - AUTO PROD EQUIP FOR LAP OF XM 692 MINE DISPENSING SYSTEM

2683 460

PROBLEM - PRESENT PRODUCTION FACILITY TO LAP THE XM692 MINE DISPENSING SYSTEM IS LIMITED TO A MANUAL/MANUAL ASSIST OPERATION WITH ATTENDANT PRODUCTION UNIT COSTS AND HIGH PERSONNEL EXPOSURE.

SOLUTION - PROJECT WILL PROVIDE EQUIPMENT DESIGNS AND PROTOTYPE EQUIPMENT TO AUTOMATICALLY LOAD AND ASSEMBLE THE XM67 MINE, THEREBY REDUCING PERSONNEL HAZARDS AND PRODUCTION COSTS WHILE PROVIDING A MORE UNIFORM AND RELIABLE ITEM.

(4368) TITLE - DEV AUTOMATED EQPT FOR SEALING M55 DETONATORS

716

PROBLEM - CURR M55 DETS ARE BEING LACQUERED. 2 APPROACHES TO SEALING ARE BEING INVEST. 1 USED FOIL PRECOATED W/ADHESIVE + THE OTHER WELDS THE DET CUP TO FOIL. BOTH CAN BE PERF ON A LOADER. LESS HANDLING WILL REDUCE COST OF DET.

SOLUTION - DEVELOP EQUIPMENT BASED ON EITHER THE HOT MELT ADHESIVE OR ULTRA SONIC WELDING TECHNIQUE CURRENTLY BEING INVESTIGATED. RETROFIT BOTH SINGLE-TOOL AND MULTI-TOOL DETONATOR LOADERS WITH EQUIPMENT TO SEAL THE M55 DETONATOR.

(4385) TITLE - MECH OF ASSY OPERATION OF CENTER CORE IGNITERS

540

PROBLEM - CURRENT TECHNIQUES TO ASSEMBLE THE CLOTH IGNITER ASSEMBLY TO THE IGNITER TUBE REQUIRES LARGE NUMBERS OF OPERATORS HANDLING HIGHLY HAZARDOUS BLACK POWDER.

SOLUTION - THIS PROJECT WILL DEVELOP EQUIPMENT TO MECHANICALLY ASSEMBLE THIS IGNITER ASSEMBLY. THIS WILL ENABLE THE REDUCTION OF PERSONNEL IN HAZARDOUS OPERATIONS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- ASSEMBLY

(CONTINUED)

(4501) TITLE - ADHESIVE BOND OF IGNITER AND FLASH REDUCER BAGS OR COMPONENT

565 723

PROBLEM - PIP NO 1-82-09-7715 WILL PROVIDE AN ALTERNATE TO SEWING CLOTH ENCLOSURES FOR IGNITER AND FLASH REDUCER COMPARTMENTS ON PROPELLANT CHARGE BAGS.

SOLUTION - DEVELOP PRODUCTION EQUIPMENT TO APPLY ADHESIVE AND PROVIDE A QUALITY CLOTH-TO-CLOTH BOND.

(4513) TITLE - AUTOMATIC GRENADE DECARTONIZING

475

PROBLEM - M42/M46 GRENADES ARRIVE IN BOXES ON BANDED PALLETS. THE PALLETS ARE DE-BANDED AND BOXES REMOVED, OPENED AND DISTRIBUTED TO THREE UNPACKING STATIONS. GRENADES ARE REMOVED FROM THE BOXES AND PUT ON THE CONVEYORS. AN OPERATOR DISCARDS THE EMPTY BOXES.

SOLUTION - AUTOMATE THE OPERATION FROM BOX OPENING TO PLACEMENT OF THE GRENADES ON THREE CONVEYORS. BOXES WILL BE OPENED AND GRENADES REMOVED. THE GRENADES WILL BE PLACED ON CONVEYORS. THE STATION WILL HAVE TO HANDLE BOTH M42/M46 AT THE RATE OF 300/MINUTE.

(4523) TITLE - RAPID MOISTURE ANALYSIS OF EXPLOSIVE MIXES

175

PROBLEM - PRESENT MOISTURE ANALYSIS TECHNIQUE REQUIRES SOME 3 3/4 HOURS PER SAMPLE. IN AN AUTOMATED BACKLINE, THIS IS TOO LONG A PERIOD TO WAIT RELATIVE TO AN ACCEPTANCE/REJECTION DECISION FOR THE BATCH.

SOLUTION - INVESTIGATE THREE KNOWN TECHNIQUES FOR RAPID MOISTURE ANALYSIS AND PROCEED WITH THE OPTIMUM TO THE PROTOTYPE STAGE.

(4526) TITLE - PRESS LOADING BLU-63 BOMBLETS & ACM MUNITIONS

285

115

PROBLEM - CAST LOADING PROCESSES FOR BOMBLETS RESULT IN EXCESSIVE LOADING COSTS BECAUSE DOUBLE TO TRIPLE THE AMOUNT OF EXPLOSIVE IS NEEDED TO PROVIDE FOR THE RESULTING RISER SCRAP. RISER SCRAP REPROCESSING COSTS ARE ALSO INCURRED.

SOLUTION - PRESS LOADING CAN BE DONE WITH EXISTING LOADING EQUIPMENT. SMALL MUNITION ITEMS CAN BE BACKED UP WITH A SUPPORT FIXTURE TO WITHSTAND THE HIGH COMPACTING PRESSURES. STATIC FIRING TESTS OF LIVE MUNITION ITEMS WILL BE DONE TO CHECK OUT PERFORMANCE.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(2711) TITLE - IMPROVE CONTROLS AND SEWING OF 2-D SEWING SYSTEM

595

PROBLEM - LOCKSTITCH SEWING REQ FREQUENT SHUTDOWN OF EQUIP TO CHANGE BOBBINS. DEFICIENT + OBSOLETE CONTROL SYS CAUSES FREQ DOWNTIME. INADEQUATE CONTROL OF CLOTH MOVEMENT RESULTS IN SUBSTANTIAL NUMBERS OF OUT-OF-TOLERANCE BAGS.

SOLUTION - PROVIDE FOR AUTOMATIC BOBBIN REWINDING AND INSERTION, REPLACE CONTROL SYSTEM. REPLACE PRESENT CLOTH FEED, TENSION CONTROL AND EDGE CONTROL SYSTEMS.

(4251) TITLE - AUTO MANU OF DELAY FOR M549 AND XM650 PROJECTILES

968

PROBLEM - CURRENT OPERATION ARE LABOR INTENSIVE. COST OF ITEM IS HIGH.

SOLUTION - DEV AUTO LAP EQUIP.

(4522) TITLE - AUTO CARRIER CLEANING STATION FOR DET FAC

500

PROBLEM - CARRIERS USED IN PRODUCTION MAY HAVE CONSIDERABLE POWDER ON THEM WHICH MUST BE REMOVED IN A SAFE MANNER. THE CURRENT MANUAL OPERATION IS POTENTIALLY HAZARDOUS.

SOLUTION - DEVELOP AN AUTOMATED POWDER REMOVAL AND CLEANING STATION FOR THE AUTOMATED CONVEYOR SYSTEM AT THE LSAAP MODERNIZED DETONATOR FACILITY.

(4550) TITLE - AUTO ASSY OF M22 FLASH SIMULATOR

985

PROBLEM - ITEM MANUFACTURED IN TEST QUANTITIES ONLY. PLANS ARE TO PROCURE FROM LONGHORN AAP ON HAND LINE WHICH IS EXPECTED TO RESULT IN A LABOR INTENSIVE OPERATION.

SOLUTION - THE MMT WILL DEVELOP AUTOMATED EQUIPMENT AND REDUCE LABOR FOR MANUFACTURE.

COMPONENT -- LOAD

(D001) TITLE - 60MM SMOKE PDN TECH F/IMPROVED SMOKE MUNITION

460

PROBLEM - A FAMILY OF NEW IMPROVED WP SMOKE ROUNDS INCLUDING 60MM MORTAR IS BEING DEVELOPED. FUTURE PRODUCTION IS DEPENDENT ON THE AVAILABILITY OF NEW TECHNOLOGY AND PRODUCTION EQUIPMENT.

SOLUTION - DEVELOP TECHNOLOGY REQUIRED TO DESIGN PILOT EQUIPMENT FOR FILLING IMPROVED SMOKE 60MM MUNITION INCORPORATING WICK MATERIAL WITH WP.

(L308) TITLE - PRESS/INJECTION LOADING OF INSENSITIVE HE

200

PROBLEM - NO PROBLEM PROVIDED.

SOLUTION - NO SOLUTION PROVIDED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- LOAD

(CONTINUED)

(P018) TITLE - DEVELOP IMPROVED FILLING METHOD FOR M74 ROCKET 250

PROBLEM - TPA FILLING METHOD IS SLOW AND CAUSES INEFFICIENT OPERATION.

SOLUTION - EVALUATE AND SELECT OPTIMUM FILL EQUIPMENT TO REDUCE FILLING TIME.

(P244) TITLE - MODERNIZATION OF TRACER LOADING 750

PROBLEM - CURRENT TRACER LOADING TECHNOLOGY UTILIZES CONSIDERABLE LABOR, SLOW/SINGULAR OPERATING TYPE PRESSING MACHINES.

SOLUTION - DEVELOP MODERN AUTOMATED MULTIPLE ITEM LOADING EQUIPMENT. HIGH PRODUCTION, LOW MAINTAINABILITY, ECONOMICAL AND RELIABLE EQUIPMENT ADAPTABLE TO NUMEROUS TRACER ITEMS WILL RESULT.

(1367) TITLE - DEVELOP MFG TECHNOLOGY FOR XM96 CS ROCKET 400

PROBLEM - NEVER PRODUCED AT PBA. MOBILIZATION REQUIREMENT.

SOLUTION - PROVIDE MFG TECHNOLOGY. PROVIDE DESIGN CRITERIA FOR IPF.

(1701) TITLE - BULK TRANSFER OF CHEMICAL MATERIALS 221 203

PROBLEM - CURRENT TECHNIQUE FOR RETRIEVAL WEIGHING AND TRANSPORTING PYROTECHNIC CHEMICAL CONSTITUENTS ARE ACCOMPLISHED BY LABOR INTENSIVE OPERATION AND ARE UNSAFE.

SOLUTION - AN EFFICIENT MATERIALS HANDLING SYSTEM WILL BE SURVEYED AND DEVELOPED SO THAT EPA/OSHA STANDARDS WILL BE MET.

(1902) TITLE - MFG METHODS OF GEL FUEL FOR FAE BOMBS BLU-95/B AND BLU-96/B 473

PROBLEM - A PROCESS TO PRODUCE LARGE QUANTITIES OF THIXOTROPIC FUEL CONTAINING PROPYLENE OXIDE DOES NOT EXIST. THE FUEL, DUE TO ITS FLAMMABLE AND THIXOTROPIC PROPERTIES, PRESENTS MAJOR PROBLEMS IN THE AREAS OF MIXING, STORAGE, PUMPING, AND LOADING.

SOLUTION - DETERMINE PROCESS AND MANUFACTURING TECHNIQUES SUITABLE FOR MASS PRODUCING, TRANSPORTING, AND LOADING THIXOTROPIC GEL CONTAINING PROPYLENE OXIDE FUEL AND EVALUATE AVAILABLE PROCESSING EQUIPMENT.

(2016) TITLE - COLD PRESSING OF EXPLOSIVES 750

PROBLEM - LOAD OF HMX EXPLOSIVES INTO SHAPED CHARGES + PRESSED AMMO + PRESSING PELLETS IS SLOW + COSTLY DUE TO HEAT, VACUUM + NOT PRESSING REQ. USE OF EXPLOSIVE TO OVERCOME POTENTIAL EXUDATION + LOW DENSITY CHARGE PROBLEMS W/CAST CHARGES CANNOT BE REALIZED.

SOLUTION - NEW EXPLOSIVE HAS BEEN DEV WHICH HAS HMX AS ITS BASE, PROPERTIES SIM TO OCTOL + LX14 EXPLOSIVES + CAN BE COLD PRESSED. AUTOMATING COLD PRESSING OF HMX WILL ENHANCE ITS USE, WILL REDUCE COST DRASTICALLY + ELIM POTENTIAL FOR EXPLOSION.

COMPONENT -- LOAD

(CONTINUED)

(2018) TITLE - INJECTION MOLDING TECHNIQUES FOR ACM/CEMS

285

PROBLEM - CURRENT EXPLOSIVE LOADING TECHNIQUES FOR SMALL MUNITIONS USE GRAVITY POURING WHICH REQUIRES PERSONNEL EXPOSURE TO EXPLOSIVES AND RESULTS IN LARGE AMOUNTS OF RISER SCRAP.

SOLUTION - DEVELOP AUTOMATIC PRODUCTION INJECTION MOLDING EQUIPMENT TO LOAD ACM AND CEM ITEMS WHICH WILL VIRTUALLY ELIMINATE EXPLOSIVE RISER SCRAP AND DRASTICALLY REDUCE PERSONNEL EXPOSURE.

(2077) TITLE - IMPROVED PROCESS FOR HE CAVITY FORMING

650

PROBLEM - CURRENT GOCO PROCESSES REQUIRE MACHINING OF EXPLOSIVE CAVITIES. THIS IS VERY HAZARDOUS AND MUST BE PERFORMED BEHIND A BARRICADE AND IS VERY COSTLY.

SOLUTION - REDESIGN HE POURING FUNNEL TO ELIM MACHINING. THIS WILL DRASTICALLY REDUCE COST AS NO BARRICADE IS REQUIRED, EXPENSIVE MACHINERY/MAINT IS ELIMINATED AND SUPPORTING LABOR IS REDUCED.

(3032) TITLE - IMPROVED PROCESS TECHNOLOGY FOR CASTABLE PBX EXPLOSIVE

435 350

PROBLEM - LARGE SHAPED CHARGE WARHEADS UTILIZE PRESSED EXPLOSIVES WHICH REQUIRE LARGE CAPACITY PRESSES AND LENGTHY PRESS CYCLE AND ANNEALING TIMES. COSTS ARE RELATIVELY HIGH AND QUANTITIES CANNOT BE INCREASED WITHOUT A LARGE INVESTMENT IN PRESS CAPACITY.

SOLUTION - CASTABLE PBX EXPLOSIVES ARE BEING DEVELOPED FOR HIGH PERFORMANCE WARHEADS BY THE NAVY. EVALUATE THE MOST ADVANCED COMPOSITIONS, LOADING EXISTING ARMY SHAPED CHARGE WARHEADS TO DETERMINE REQUIRED PROCESSING CONDITIONS AND TO EVALUATE PERFORMANCE.

(4078) TITLE - UPGRADE SAFETY READINESS AND PRODUCTIVITY OF EXIST MOLT POUR

867 552

PROBLEM - SIGNIFICANT IMPROVEMENT OF MELT POUR FACILITIES IS NOT BEING REALIZED BECAUSE DESIGN APPROACHES FOR COST-EFFECTIVE INTERMEDIATE UPGRADING ARE NOT AVAILABLE.

SOLUTION - DEVELOP A SERIES OF PROCESS DESIGN CONCEPTS TO IMPROVE SAFETY, REDUCE EXPLOSIVE QUANTITIES, REMOVE PERSONNEL FROM HAZARDOUS AREAS, INCREASE EFFICIENCY AND REDUCE PRODUCTION COSTS. PROVIDE MODULAR DESIGN PKGS F/VARIOUS PROCESSES AND UPGRADING LEVELS.

(4086) TITLE - REPROCESSING EXPLOSIVE FINES AND DRILL SCRAP

212 621

PROBLEM - FINELY DIVIDED EXPLOSIVE SCRAP GENERATED IN CAVITY DRILLING AND RISER CRUSHING OPERATIONS IS CURRENTLY BURNED AS WASTE. IT CANNOT BE REPROCESSED IN ITS GENERATED STATE DUE TO HANDLING PROBLEMS AND AGGLOMERATION WHEN INTRODUCED INTO MELT SYSTEMS.

SOLUTION - DEVELOP A SYSTEM TO SCREEN, INSPECT AND REPROCESS THE FINE EXPLOSIVE INTO FLAKE EXPLOSIVE THAT CAN BE EASILY TRANSPORTED AND DIRECTLY INTRODUCED INTO MELT POUR SYSTEMS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- LOAD

(CONTINUED)

(4137) TITLE - AUTO LOADING OF CENTER CORE IGNITERS

272 1100

PROBLEM - LOADING OF THE LONG SLENDER CLOTH BAG IS AN AREA WHICH REQUIRES HIGH LABOR COSTS AND SUBJECTS A LARGE NUMBER OF PERSONNEL TO HAZARDOUS OPERATIONS.

SOLUTION - DEVELOP A LOADING STATION TO WEIGH AND LOAD BOTH THE CENTER CORE BAG AND THE BASE PAD.

(4373) TITLE - SILK SCREEN DEPOSITION OF PRIMARY EXPLOSIVES

730

PROBLEM - CURRENT NON-ELECTRIC DETONATOR FACILITIES, EQUIPMENT AND METHODS LACK VERSATILITY, PRESENT PROBLEMS IN QUALITY AND UNIFORMITY OF PRODUCT AND ARE COSTLY IN OPERATION AND MAINTENANCE.

SOLUTION - EVAL NEW IMPROVED OR MODIFIED EQUIPMENT AND TECHNIQUES FOR THE MASS PRODUCTION OF DETONATORS USING SILK-SCREEN TECHNIQUES WITH THE ULTIMATE GOAL OF MODERNIZING PRODUCTION FACILITIES.

(4497) TITLE - HANDLING EQUIPMENT FOR ADAM OVERLAYS

636

PROBLEM - THE ADAM PROPELLANT OVERLAY IS MANUALLY CONVEYED BETWEEN SIX MODULES. THE MANUAL CONVEYANCE IS SLOW AND EXPOSES PERSONNEL TO HAZARDOUS OPERATIONS.

SOLUTION - DEVELOP A MATERIAL HANDLING SYSTEM TO AUTOMATICALLY LOAD AND UNLOAD EACH STATION AND TO CONVEY PARTS BETWEEN STATIONS DURING THE WELDING AND FILLING OPERATION.

(4520) TITLE - DEV PROCESS F/PRESS LOADING 105MM HEAT-MP-1, XM815 PROJ

50 40

PROBLEM - THE 105MM XM815 WILL BE THE FIRST TANK ROUND TO USE A PRESSED SHAPED CHARGE. A PRODUCTION PROCESS FOR PRESS LOADING MUST BE ESTABLISHED EVALUATING SEVERAL CANDIDATE EXPLOSIVES AND ESTABLISHING TOOLING DESIGN AND PRESSING PARAMETERS.

SOLUTION - PROCESSING PROCEDURES WILL BE ESTABLISHED FOR CANDIDATE EXPLOSIVES AND A LIMITED NUMBER OF UNITS LOADED, TESTED, EVALUATED. PROCESS EQUIPMENT WILL BE IDENTIFIED SO THAT PROPER PRESS LOADING PROCEDURES MAY BE IMPLEMENTED INTO PRODUCTION.

(4524) TITLE - LOW VOLUME AUTO MELT-POUR EQUIP FOR LOADING SMALL AP MINES

135 145

PROBLEM - CURRENT EXPLOSIVE LOADING OF SMALL AP MINES IS ACHIEVED BY HIGHLY LABOR INTENSIVE OPERATIONS. LARGE VOLUME TECHNIQUES ARE NOT APPLICABLE BECAUSE OF LOW PLANNED PRODUCTION QUANTITIES.

SOLUTION - DEVELOP A LOW COST, LOW VOLUME AUTOMATED INJECTION MOLDING SYSTEM FOR MELT LOADING OF FASCAM MINES.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PACK

(4253) TITLE - AUTO HIGH RATE UNPACK EQUIP FOR MORTAR PROP CHGS

603

PROBLEM - HANDPACKING ON THE MORTAR PROPELLING CHARGES M204 AND 205 LAP LINE RESULTS IN UNSAFE CONDITIONS AND DAMAGE TO PARTS.

SOLUTION - DEVELOP AUTOMATED EQUIPMENT TO REPLACE HANDPACKING.

(4516) TITLE - AUTO CARTONING OPERATIONS F/105MM

560

PROBLEM - THE PACKOUT OF 105MM TANK ROUNDS INTO FIBER CONTAINERS WITH THE FILLER MATERIALS AND MARKINGS IS A LABOR INTENSIVE OPERATION WITH HIGH EXPOSURE OF PERSONNEL TO LIVE AMMUNITION.

SOLUTION - DEVELOP AUTOMATED EQUIPMENT TO PACKOUT THESE 105MM ROUNDS.

* C A T E G O R Y *

METAL PARTS

COMPONENT -- CARTRIDGE CASES

(D028) TITLE - SPIRAL WRAP CARTRIDGE CASE FOR 105MM-TANK AMMO

400

PROBLEM - PIP PROJECT 1-73-09-0040 IS CURRENTLY WORKING OUT QUALITY PROBLEMS WITH THE USE OF A SPIRAL WRAPPED CARTRIDGE CASE. THIS CASE WILL REPLACE THE DEEP DRAWN CARTRIDGE CASE WHICH IS CURRENTLY MASS PRODUCED.

SOLUTION - DEVELOP TECHNIQUES TO RELIABLY AND EFFICIENTLY HANDLE MATERIAL AND MANUFACTURE CARTRIDGE CASES USING SPIRAL WRAPPING.

(4542) TITLE - ULTRASONIC DEEP DRAWING OF CANNON STEEL CARTRIDGE CASES

350 250

PROBLEM - DEEP DRAWN STEEL CASES REQUIRE MULTIPLE DRAWS AND REQUIRE EXCESSIVE PROCESSING AND ENERGY VS BRASS.

SOLUTION - ULTRASONIC ACTIVATION OF FORMING DIES HAS POTENTIAL FOR REDUCING DRAWING FORCES AND ELIMINATING STEPS IN THE DRAWING PROCESS.

COMPONENT -- FORMING/MACHINING

(D005) TITLE - ALTERNATE ASSY FOR SOLDERED AND BRAZED JOINTS

550

PROBLEM - BRAZING AND SOLDERING OPERATIONS REQUIRE PRECISE CONTROL OF CLEARANCES, TEMPERATURES AND FLUXES IN ORDER TO OBTAIN ACCEPTABLE JOINTS.

SOLUTION - ALTERNATE METHODS OF JOINING COMPONENTS WILL BE INVESTIGATED TO REDUCE COST AND ENHANCE RELIABILITY.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- FORMING/MACHINING

(CONTINUED)

(D007) TITLE - ADAPTIVE CONTROL OF DIMENSIONS OF METAL COMPONENTS

PROBLEM - WEAR OF CUTTING TOOLS AND GRINDING WHEELS EVENTUALLY PRODUCES OUT OF TOLERANCE DIMENSIONS.

SOLUTION - UTILIZE SENSING DEVICES AND ADAPTIVE CONTROLS TO AUTOMATICALLY COMPENSATE FOR TOOL AND WHEEL WEAR.

550 350

(L221) TITLE - ANTI-ARMOR WHD LINES F/XM84

PROBLEM - COSTLY AND TIME CONSUMING MANUFACTURING PROCESS FOR MASS PRODUCING SELF-FORGING FRAGMENT LINERS WITH VARYING WALL THICKNESS.

SOLUTION - DETERMINE OPTIMUM PROCESS SUCH AS HYDROFORMING, ELECTROPLATING AND/OR MACHINING. PROVE OUT PROCESS.

350 550

(L242) TITLE - N/C EQUIPMENT METAL PARTS PRODUCTION

PROBLEM - NC EQUIP HAS BEEN USED IN AMMO PON LINES BUT ITS INHERENT ACCURACY AND REPEATABILITY IN MACHINING NEW COMPONENTS HAS NOT BEEN ASSESSED.

SOLUTION - USING A THREE-PHASE PROGRAM (1) STUDY FEAS OF ADAPTING AN NC MACHINE TOOL W/SIMULTANEOUS CUTTING CAPABILITY (2) IF FEASIBLE, ADAPT AN NC MACHINE TO TEST CONCEPT (3) PROVE CONCEPT IN PDN ENVIRONMENT.

200 150

(L245) TITLE - FORGING OF ALUMINUM COMPONENTS

PROBLEM - FORGINGS FOR OGIVES, BASES, AND FINS ARE IMPACT EXTRUDED WITH LARGE AMOUNT OF MATERIAL LEFT THAT HAS TO BE MACHINED OFF.

SOLUTION - INVESTIGATE USING NET SHAPE FORGING TO ELIMINATE MACHINING OPERATIONS AND MATERIAL WASTE.

250

(2040) TITLE - ACOUSTIC EMISSIONS TO CONTROL METAL WORKING OPS

PROBLEM - IN MANY INSTANCES DEFECTS THAT OCCUR IN THE MFG OF MUNITIONS MPTS ARE NOT SCREENED OUT UNTIL INSPECTION AT THE END OF THE LINE RESULTS IN LOTS OF SCRAP BEFORE PROBLEM IS DETECTED.

SOLUTION - ACOUSTIC EMISSION FROM METAL WORKING OPERATIONS CAN BE MONITORED AND ANALYZED TO CONTROL SPECIFIC PROCESS VARIABLES. FOR EXAMPLE, ACOUSTIC EMISSIONS CAN DETECT GENERATION OF A DEFECT IN METAL WORKING OPERATIONS OR MONITOR TOOL WEAR.

275 300

(2726) TITLE - LASER CUTTING SLOTS IN HARDENED STEEL STRUCTURES

PROBLEM - CURRENT TECHNOLOGY EMPLOYED TO FORM SLOTS IN HARDENED STEEL STRUCTURE OF VARYING THICKNESS IS SLOW AND COSTLY. A MORE COST EFFECTIVE TECHNIQUE IS REQUIRED.

SOLUTION - ADAPT STATE-OF-THE-ART MICROPROCESSOR CONTROLLED LASER CUTTING EQUIPMENT TO PRODUCE CLOSE TOLERANCED ORDNANCE CONFIGURATIONS IN HARDENED STRUCTURES.

250

COMPONENT -- FORMING/MACHINING

(CONTINUED)

(2727) TITLE - PRECISION CONE LATHE FABRICATION

160

PROBLEM - THERE IS NO EFFECTIVE PROVISION FOR MACHINING PRECISION SHAPED CHARGE CONE LINERS IN MEDIUM RANGE PRODUCTION QUANTITIES. YEARLY PRODUCTION RATE OF COPPERHEAD FALLS IN THE MID-RANGE CATEGORY.

SOLUTION - MODIFY A MACHINE TO PROVIDE A BROAD RANGE OF PRECISION SHAPED CHARGE LINERS AT MODERATE VOLUMES AND COMPARATIVELY LOWER COSTS.

(2731) TITLE - ULTRASONIC ASSISTED MACHINING

350

PROBLEM - DIFFICULT TO MACHINE MATERIALS REQUIRE REDUCED FEEDS AND SPEEDS AND INCREASED TOOL WEAR AND BREAKAGE ALL OF WHICH CONTRIBUTES TO INCREASED MACHINING COSTS.

SOLUTION - STUDIES SHOW THAT ULTRASONIC ACTIVATION OF CUTTING TOOLS RESULTED IN REDUCED LOADS AND WEAR WHEN CUTTING DIFFICULT TO MACHINE MATERIALS. ECONOMIC BENEFITS WILL BE ESTABLISHED BY APPLYING THE LAB METHODS TO REAL WORLD MACHINING SITUATIONS.

(3015) TITLE - IUD FOR DU CORES

150 700

PROBLEM - ACCELERATED CORROSION TESTING OF STABALLOY CORES HAS INDICATED A POTENTIAL CORROSION PROBLEM WITH UNCOATED STABALLOY CORES IN LONG TERM STORAGE. CONVENTIONAL COATING PROCESSES SUCH AS PAINTING AND ELECTROPLATING ARE NOT SATISFACTORY.

SOLUTION - INVESTIGATE ION VAPOR DEPOSITED COATINGS. DETERMINE EQUIPMENT REQUIREMENTS, INSPECTION AND TEST PROCEDURES, PROCURE A PIECE OF PRODUCTION EQUIPMENT, AND ESTABLISH PROCESS PARAMETERS.

(3206) TITLE - MANUFACTURING PROCESS FOR CALIBER .50-30MM PENETRATORS

330 400

PROBLEM - CURRENT PROCESS GENERATES HIGH SCRAP RATES OF RADIOACTIVE CONTAMINANTS WHICH PRESENTS DISPOSAL PROBLEMS.

SOLUTION - DEFINE FULL PRODUCTION PROCESS AND EQUIPMENT FOR MANUFACTURE OF DU PENETRATORS BY SKEWED AXIS ROLL FORMING TECHNIQUES.

(3703) TITLE - WASP SHAPED CHARGE LINER

400

PROBLEM - THE WARHEAD (WASP) SHAPED CHARGE LINER IS PROJECTED TO HAVE A DOUBLE CONTOUR WITH VARIABLE THICKNESS WALLS. MACHINING COSTS FOR THIS LINER COULD BE AS MUCH AS \$250 IN "THEN-YEAR" DOLLARS.

SOLUTION - NO SOLUTION PROVIDED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- FORMING/MACHINING

(CONTINUED)

(3705) TITLE - ERAM ADVANCED MATERIAL LINES (ARB3-5)

PROBLEM - MACHINING TIME CURRENTLY REPRESENTS A LARGE PORTION OF THE WARHEAD COST WHICH WOULD BE PROHIBITIVE IN MASS PRODUCTION.

SOLUTION - ALTERNATE FORMING PROCESSES WOULD NEED TO BE INVESTIGATED WHICH COULD ECONOMICALLY PRODUCE THE LINERS WITH THE REQUIRED PRECISION.

(3712) TITLE - PRODUCTION BASE FOR NOVEL SHAPED CHARGE LINERS

PROBLEM - NEW SHAPED CHARGE MATERIALS BEING INVESTIGATED TO COMBINE HIGH MASS AND PYROPHORICITY WILL HAVE NO PRODUCTION BASE BECAUSE OF THE NATURE OF THE MATERIALS.

SOLUTION - A COMBINATION OF RHEDCASTING THE COMPOSITE AND PRESSURE CASTING TO REMOVE EXCESS LOW DENSITY MATERIAL CAN PRODUCE SHAPED STOCK FOR FURTHER WARM WORKING.

(4369) TITLE - IMPROVED PROJECTILE CAVITY SURFACE

PROBLEM - THE FORGING PROCESSES + TECHNIQUES CURRENTLY USED CAN CAUSE DEFECTS + IMPERFECTIONS ON THE CAVITY SURFACE. THIS CONDITION NEEDS CORRECTION TO PREVENT SENSITIVITY PROBLEM THAT CAN OCCUR WITH THE COMP EXPLOSIVE TO BE USED IN HE ROUNDS.

SOLUTION - INVESTIGATE THE VARIOUS OPERATIONS SUCH AS NICK AND BREAK BILLET SEPARATION, SCALE, TOOL WEAR OF FORGE, AND FOREIGN MATTER BUILD-UP. DETERMINE BEST PROCESS CHANGES.

(4380) TITLE - ABRASIVE MACHINING IN PROJECTILE MANUFACTURING

PROBLEM - NEW GENERATION OF PROJECTILES HAVE HIGH HARDNESS AND ARE MADE FROM ALLOY AND HIGH FRAGMENTATION STEELS. CONVENTIONAL MACHINING THESE ALLOYS REQUIRE SURFACE SPEEDS LOWER THAN NORMALLY EXPECTED WITH CARBON STEELS AND ARE CONSEQUENTLY HIGHER IN COST.

SOLUTION - ABRASIVE MACHINING TECHNIQUES CAN BE USED TO INCREASE THE METAL REMOVAL RATES WHEN MACHINING THE NEW GENERATION PROJECTILES MADE WITH HARD STEEL ALLOYS. THIS PROGRAM WILL INVESTIGATE BOTH RIGID AND FLEXIBLE SURFACE ABRASIVE MACHINING TECHNIQUES.

(4518) TITLE - IMPROVED TOOL STEELS FOR PROJECTILE MANUFACTURE

PROBLEM - SELECTING TOOL GRADE, HEAT-TREAT CYCLE AND SURFACE. FINISH FOR TOOLS OPERATING AT TEMPERATURES, PRESSURES AND FRICTION CONDITIONS IS A PROBLEM FOR PROJECTILE MANUFACTURERS. THE PROBLEM LEADS TO POOR SURFACE QUALITY OF PROJECTILE CAVITIES.

SOLUTION - AN EVALUATION OF NEW TOOLS STEEL AND HARD FACING MATERIALS FOR METAL FORMING IS NEEDED TO ESTABLISH TOOL STEEL GRADES AND/OR HARD FACING PARAMETERS TO MEET THE SEVERE CONDITIONS ENCOUNTERED IN PROJECTILE MANUFACTURING OPERATIONS.

600 700

528 545

150 320

400

250

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- FORMING/MACHINING

(CONTINUED)

(4519) TITLE - OUTLINE AUTOMATIC DETECTION OF TOOL WEAR

PROBLEM - TOOL WEAR ON SEMIAUTOMATIC METAL MACHINES CAUSE DEFECTIVE PARTS IF UNDETECTED.

SOLUTION - PROVIDE AN AUTOMATIC MEASURING DEVICE ON THE TRANSPORTER OF THE LOAD/ UNLOAD SYSTEM.

50 40

(4528) TITLE - ROTARY FORGING OF DU PENETRATORS

PROBLEM - CURRENT FABRICATION TECHNIQUES FOR THE PRODUCTION OF DU PENETRATORS INVOLVE CONSIDERABLE MACHINING WITH ASSOCIATED HIGH COST AND WITH ACCOMPANYING PROBLEMS OF DISPOSAL OF THE RESULTANT MATERIAL SCRAP.

SOLUTION - APPLICATION OF ROTARY FORGING TECHNOLOGY TO THE FABRICATION OF NEAR NET SHAPE DU PENETRATORS RESULTING IN CONSIDERABLY LESS FINISH MACHINING AND SCRAP.

500 800

(4529) TITLE - MFG OF TWO PIECE NOSE FOR HEAT PROJECTILE

PROBLEM - THE FUTURE GENERATION HEAT PROJECTILES NOW IN DEVELOPMENT EMPLOY TWO-PIECE CONICAL NOSE. THE TOLERANCES REQUIRED FOR THE LOW-DRAW OUTER PROFILE AND FOR THE GAP BETWEEN INNER AND OUTER CONES PRESENT A PRODUCTION PROBLEM.

SOLUTION - EVALUATE TWO ALTERNATE METHODS OF PRODUCTION, I.E., SHEAR FORMING VS DRAW/ ANNEAL. PHASE ONE WOULD TEST 50 PROJECTILES PRODUCED BY EACH CANDIDATE PROCESS. PHASE TWO WOULD FABRICATE 100 PROJECTILES BY THE PRODUCTION PROCESS CHOSEN DURING PHASE ONE.

585 450

(4530) TITLE - MFG OF PRECISION CONES FOR HEAT PROJECTILES

PROBLEM - THE HEAT PROJECTILE LINER MUST BE HELD TO .003" IN ANY TRANSVERSE PLANE AND WITHIN .006" ALONG ITS LENGTH. THE TOLERANCES ARE AT THE EXTREME LIMIT OF ACCURACY. THE XMB15 LINER REQUIRES PRECISION AN ORDER OF MAGNITUDE GREATER (.0005").

480 360

SOLUTION - PHASE ONE WOULD EXAMINE TWO CANDIDATE PROCESSES - SHEAR FORMING AND DRAW/ANNEAL. FIFTY ROUNDS WOULD BE TESTED BY EACH PROCESS. ONE CANDIDATE PROCESS WILL BE CHOSEN FOR FURTHER DEVELOPMENT DURING THE SECOND PHASE.

(6716) TITLE - DEV COMP-AID MODEL OF FORMING OPERATIONS FOR ARTILLERY MPTS

PROBLEM - TRIAL AND ERROR METHODS AND THE ABSENCE OF PROVEN AUTOMATED DESIGN TECHNIQUES FOR TOOLING CAUSE UNEXPECTED FAILURES IN FORMING OPERATIONS AND DELAYS IN STARTUP OF AMMUNITION PRODUCTION LINES.

SOLUTION - DEVELOP ANALYTICAL MODELS AND AUTOMATED TOOL DESIGN METHODS OF CRITICAL METAL FORMING OPERATIONS. TOOL DESIGNS THUS GENERATED WILL BE TESTED IN A PRODUCTION SETTING TO VERIFY THE COMPUTER MODELS. PROVEN MODELS ARE APPLICABLE TO CURRENT AND FUTURE ITE

851 157

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROJECTILES

(D006) TITLE - AUTOMATED MATERIAL HANDLING

PROBLEM - MATERIAL HANDLING IN MUNITIONS METAL PARTS PROCESSING IS A SIGNIFICANT ELEMENT OF COST.

SOLUTION - NEW AUTOMATIC HANDLING DEVICES SUCH AS PROGRAMMABLE ROBOTS WILL BE INVESTIGATED FOR APPLICABILITY TO MUNITIONS COST REDUCTION.

400 800

(D010) TITLE - BILLET NICKING IMPROVEMENT

PROBLEM - PRESENT PRACTICE OF TORCH NICKING OF STEEL BILLETS FOR PROJECTILE FORGING PRODUCES A PERCENTAGE OF NON-UNIFORM BREAKS THAT RESULT IN FORGING REWORK OR SCRAP.

SOLUTION - INVESTIGATE OTHER FORMS OF NICKING SUCH AS PLASMA ARC, ELECTRON BEAM AND LASER TO IMPROVE QUALITY OF BREAKS.

300

(D011) TITLE - IMPROVED SWAGING OF ROTATING BANDS

PROBLEM - WEST TIRE SETTER BANDING MACHINES ARE COMMONLY USED FOR SWAGING ROTATING BANDS TO PROJECTILE BODIES. THE COMPANY IS NO LONGER IN BUSINESS AND PARTS ARE NOT AVAILABLE FOR IPE IN BASE. NEW LANTOMATICS AT SCRANTON AND LOUISIANA ARE NOT OPERABLE.

300

SOLUTION - INVESTIGATE NEW EQUIPMENT DESIGNS TO REPLACE WEST TIRE SETTERS.

(D026) TITLE - SINTERED IRON ROTATING BAND FOR 20MM M220/M246

PROBLEM - UNDER PIP 1-80-09-0005 AN ALTERNATE MATERIAL, SINTERED IRON, IS TO BE QUALIFIED TO REPLACE THE STANDARD COPPER BAND ON AUTOMATIC CANNON AMMUNITION. CURRENT MANUFACTURING TECHNIQUES PROVIDES FOR EMPLACEMENT OF A COPPER BAND.

250

300

SOLUTION - DEVELOP THE NECESSARY MANUFACTURING TECHNIQUES WHICH TAKES INTO ACCOUNT THE SINTERED IRON BAND MATERIAL.

(L139) TITLE - COLD SHEARING OF ALUMINUM SLUGS FOR FORGING

PROBLEM - CURRENTLY ALUMINUM BILLETS ARE SAWED TO PROVIDE SLUGS FOR FORGING. THE KERF LOSS IS APPROXIMATELY 0.243 POUNDS PER SLUG.

120

SOLUTION - ADVANCES IN THE STATE-OF-THE-ART OF COLD SHEARING AND POTENTIAL COST SAVINGS WARRANTS INVESTIGATION OF COLD SHEARING ALUMINUM SLUGS FOR FORGING.

(1907) TITLE - AUTO GAGING FOR 5 INCH PROJECTILE

PROBLEM - CURRENT INSPECTION IS INADEQUATE TO MEET 5 INCH PROJECTILE BODIES REQUIREMENT AND REQUIRES DESIGN CHANGES.

625

SOLUTION - DEVELOP AUTOMATED ACCEPTANCE INSPECTION SYSTEM FOR 5 INCH 38 AND 5 INCH 54 CALIBER PROJECTILE BODIES.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROJECTILES

(CONTINUED)

(3209) TITLE - POWDERED METAL (PM) FOR LOW DRAG 20-40MM PROJECTILES

PROBLEM - LOW DRAG PROJECTILES REQUIRE SIGNIFICANT AMOUNT OF MACHINING AND INSPECTION. CONSEQUENTLY, EACH PROJECTILE IS EXPENSIVE AND THE PROCESS SEVERELY LIMITS PRODUCTION RATES.

SOLUTION - PM MANUFACTURING TECHNIQUES MAY INCREASE PRODUCTION RATES WHILE REDUCING COST. A SECONDARY COINING OPERATION MAY OR MAY NOT BE REQUIRED; HOWEVER, THE TOTAL MACHINING OPERATION IS REDUCED TO, AT MOST, TWO.

475 327

(4189) TITLE - HIGH FRAGMENTATION STEEL PRODUCTION PROCESS

1821 1697

PROBLEM - THE CURRENT PRODUCTION PROCESS FOR MANUFACTURING HFI PROJECTILES IS EXTREMELY EXPENSIVE. PROPRIETARY PRODUCTION PROCESSES DEVELOPED BY PRIVATE INDUSTRY ARE NOT AVAILABLE.

SOLUTION - EXAMINE NEW AND IMPROVED PRODUCTION PROCESSES FOR REDUCTION OF STARTING MULTI-WEIGHT, MACHINING TECHNIQUES, ANNEALING FORGINGS, ONE-HIT HOT NOSING, HEAT TREATING AND FRACTURE TOUGHNESS. WILL COMPLETE A TDP FOR COMPETITIVE PROCUREMENT.

(4517) TITLE - PROCESS FOR RECYCLING STABALLOY MACHINING CHIPS

700

PROBLEM - STABALLOY CHIPS ARE PYROPHORIC AND MUST BE DISPERSED IN AN INERT MATERIAL TO BE DISPOSED OF BY BURIAL AS A RADIOACTIVE MATERIAL. RECYCLING INTO USABLE METAL WOULD SOLVE DISPOSAL PROBLEMS.

SOLUTION - CONTINUE EFFORT INITIATED IN FY80 W/REDIRECTED FY79 FUNDS. VARIOUS APPROACHES TO CHIP RECYCLING ARE BEING EXPLORED. ONE APPROACH SHOWING MOST ADVANTAGES WILL BE SELECTED FOR FURTHER OPTIMIZATION IN FY83.

(6738) TITLE - ULTRA-HIGH SPEED METAL REMOVAL, ARTILLERY SHELL

478 57

PROBLEM - DUE TO THE LOW METAL REMOVAL RATES OF THE CURRENT CONVENTIONAL MACHINING OPERATIONS, A GREATER NUMBER OF MACHINES ARE REQUIRED TO PRODUCE ARTILLERY PROJECTILES.

SOLUTION - TO ACHIEVE INCREASED METAL REMOVAL RATES ALSO TO REDUCE THE NUMBER OF MACHINES CURRENTLY USED TO PRODUCE PROJECTILES.

COMPONENT -- TOOLING

(3203) TITLE - PRECISION TOOLING FOR SMALL CALIBER AMMUNITION

180 120

PROBLEM - COST OF TOOLS AND REPLACEMENT/SETTING TIME ARE SIGNIFICANT FACTORS IN THE COST OF AMMUNITION. WORK IN THE CAN INDUSTRY SHOWS THAT SIGNIFICANT IMPROVEMENTS IN CLOSER TOLERANCES, IMPROVED GRINDING METHODS, AND TOOL LIFE CAN BE ACHIEVED.

SOLUTION - INDUSTRY TECHNIQUES WILL BE EVALUATED. SAMPLES WILL BE PRODUCED AND EVALUATED IN ACTUAL PRODUCTION ENVIRONMENT. COST AND TOOL LIFE WILL BE OPTIMIZED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TOOLING

(CONTINUED)

(4164) TITLE - ANALYSIS FOR PREDICTING FAILURE OF MFG TOOLING

PROBLEM - THE ABILITY TO PREDICT FAILURE OF MACHINE OR COMPONENTS IS NON-EXISTANT. FAILURES ARE COSTLY AND REDUCE PRODUCTION OUTPUT.

SOLUTION - FREQUENCY ANALYSIS WILL IDENTIFY MACHINE PARTS WHICH ARE DEFECTIVE, OVERLOADED, OR NOT OPERATING PROPERLY.

114 147

* C A T E G O R Y *

*POLLUTION ABATEMENT *

COMPONENT -- CHEMICAL

(1318) TITLE - EST CHEM PROD + FILL CLOSE + LAP TECH F/BVX2 XM736

PROBLEM - THE QL PROCESS FOR VX BINARY MFG RESULTS IN LARGE QUANTITIES OF WASTE, AND ORGANIC PHOSPHOROUS COMPOUNDS. PRIOR PROCEDURES FOR DISPOSAL (DEEP WELL) ARE NO LONGER ACCEPTABLE. NEW TECHNIQUES ARE REQUIRED.

SOLUTION - ESTABLISH PROCESSES TO REDUCE WASTE BY-PRODUCTS AND PROVIDE METHODS FOR DISPOSAL OF UNAVOIDABLE WASTE MATERIAL FROM PROCESS MFG.

882 216

(4298) TITLE - EVALUATION OF DMN DISPOSAL ON HSAAP B-LINE

PROBLEM - EFFLUENT FROM AMONIA RECOVERY COLUMN CONTAINS SIGNIFICANT AMOUNTS OF DMN. DMN IS ONE OF THE EPA CONSENT DECREE COMPOUNDS FOR WHICH WATER QUALITY CRITERIA MUST BE PROVIDED. EPA INSISTS ON LEVELS BELOW 0.3 PPB.

SOLUTION - EVALUATE UV PHOTOLYSIS CATALYTIC HYDROGENATION, CARBON ADSORPTION OR OTHER TECHNIQUES FOR ABATING OR DESTROYING DMN.

472 391 300

COMPONENT -- GENERAL

(1354) TITLE - SLUDGE VOLUME REDUCTION AND DISPOSAL PROCESS STUDY

PROBLEM - MCA POLLUTION ABATEMENT FACILITIES UNDER CONSTRUCTION AT PINE BLUFF ARSENAL DISCHARGE INTO A SETTLING LAGOON HAVING A FIVE YEAR CAPACITY BUT NO CLEAN OUT OR SLUDGE DISPOSAL EQUIPMENT. TO EXTEND LAGOON LIFE-SPAN, SLUDGE VOLUME MUST BE MINIMIZED.

SOLUTION - PROVIDE A PROCESS FOR LAGOON SLUDGE CLEAN-OUT + DEWATERING FOR LANDFILL DISPOSAL. VOLUME WILL BE REDUCED BY PRECLARIFICATION + EQUALIZATION TO MINIMIZE CHEMICAL TREATMENT REQUIREMENTS. EVALUATE OTHER TREATMENT CHEMICALS TO REDUCE SLUDGE VOLUME.

278 110

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(CONTINUED)

(1708) TITLE - POLLUTION ABATEMENT CONSERVATION EVALUATIONS

230

PROBLEM - PBA POLLUTION ABATE FAC HEAVY CONSUMER OF VALUABLE RESOURCES. FLOWS FROM PDA AREAS ARE NOT CURRENTLY MONITORED NOR EQUALIZED PRIOR TO TREATMENT CREATING SITUATION WHERE CHEM FEEDERS MUST BE SET A RATE TO TREAT PERIODIC SLUGS W/O NPDES.

SOLUTION - SURVEY OF WATER + CHEM UTIL IN POLLUTION ABATE FAC BE CONDUCTED IDENT CONTROL METHODS TO MINIMIZE FLOW, CHEM UTIL + REDUCE SLUDGE GENERATION. EVAL OF USE OF CONTINUOUS MONITORS IN INFLUENT EQUAL BASIN COULD MINIMIZE/OPTIMIZE CHEM + WATER USAGE

(4226) TITLE - ON-LINE MONITORS FOR WATER POLLUTANTS

98 439 426

PROBLEM - IDENTIFICATION AND MONITORING OF INDIVIDUAL MILITARY UNIQUE EFFLUENT POLLUTANTS REQUIRED BY WATER POLLUTION CONTROL ACT.

SOLUTION - DEMONSTRATE PROTOTYPE CONTINUOUS MONITORS DEVELOPED UNDER R&D PROGRAM BY FIELD TESTS ON AAP WASTEWATER EFFLUENT DISCHARGE STREAMS.

(4227) TITLE - DISPOSAL OF WASTE WATER TREATMENT SLUDGE

388

PROBLEM - WASTEWATER TREATMENT FACILITIES OF AAP'S GENERATE LARGE VOLUMES OF SLUDGE FOR WHICH LAND FILL DISPOSAL WILL BE PROHIBITED AND WHICH WILL REQUIRE COSTLY ALTERNATE DISPOSAL METHODS.

SOLUTION - ALTERNATE DISPOSAL TECHNIQUES WILL BE INVESTIGATED THAT WILL ELIMINATE PROPELLANT CONTAMINANTS BY PHYSICAL CHEMICAL THERMAL DESTRUCTION AND RECLAIM HEAVY METALS AND COMPOUNDS FOR REUSE IN THE MANUFACTURING PROCESS.

(4231) TITLE - IN-PLANT REUSE OF POLLUTION ABATED WATERS

240 464 313

PROBLEM - MORE STRINGENT STANDARDS FOR MILITARY UNIQUE POLLUTANTS. 1985 GOAL OF ZERO DISCHARGE. EXPENSE OF TREATING POLLUTION. CONTINUE THIS REUSE OF TREATED WATER IN OTHER PROCESSES.

SOLUTION - THIS PROJECT CONCENTRATES EFFORT IN RECYCLING OF TREATED WASTE WATER WITH THE ULTIMATE GOAL OF COMPLYING WITH THE ZERO DISCHARGE GUIDELINE.

(4348) TITLE - NOISE POLLUTION ABATEMENT F/SCAMP IN LCAAP

264

PROBLEM - NOISE LEVEL EXCEEDS 85 DBS IN BLDG 1 AT LAKE CITY AAP.

SOLUTION - INSTALL RECOMMENDED ONE SUBMODULE NOISE SUPPRESSION SYSTEM AND EVALUATE ALL OTHER SUBMODULES.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COM. ONENT -- GENERAL

(CONTINUED)

(4364) TITLE - ON-LINE BIO SENSORS TO MONITOR MIXED WASTE STREAMS

258 290

PROBLEM - PL92-500 REQUIRES THAT WASTE DISCHARGES BE MONITORED TO ASSURE THAT AQUATIC LIFE ARE PROTECTED FROM TOXIC/HAZARDOUS SUBSTANCES. IN ADDITION, BIOLOGICAL MONITORING WILL SOON BE REQUIRED IN SOME NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS.

SOLUTION - USE A BIOLOGICAL MONITORING SYSTEM TO EVALUATE TOXIC EFFECTS. FROM CORRELATIONS BETWEEN CHEMICAL CONSTITUENTS IN THE WASTE WATER AND BIOLOGICAL RESPONSES, EXPENSIVE CHEMICAL MONITORING MIGHT BE ELIMINATED.

COMPONENT -- PROPELLANTS/EXPLOSIVES

(4225) TITLE - RED WATER POLLUTION ABATEMENT SYSTEM

504 160

PROBLEM - RED WATER PRODUCED IN VOLUME FROM THE PURIFICATION OF TNT IS A POLLUTANT FOR WHICH A SATISFACTORY DISPOSAL METHOD DOES NOT EXIST.

SOLUTION - THE FEASIBILITY OF THE SONOCO SULFITE RECOVERY PROCESS FOR THE DISPOSAL OF RED WATER HAS BEEN DEMONSTRATED. THIS PROJECT OPTIMIZES OPERATING PARAMETERS OF CRITICAL COMPONENTS TO SUPPORT AN MCA PROJECT FOR RADFORD AAP.

(4229) TITLE - ADVANCED PINK WATER TREATMENT

353 460

PROBLEM - CURRENT PINK WATER DISPOSAL TECHNOLOGY THROUGH CARBON ADSORPTION IS HIGH IN COST EVEN WHEN REGENERATION TECHNIQUE IS UTILIZED.

SOLUTION - ALTERNATIVE TECHNOLOGIES ARE AVAILABLE WHICH CAN REDUCE THIS TREATMENT BY 50 PERCENT. IT IS LIKELY THAT A HYBRID SYSTEM WILL BE DEVELOPED THAT CAN BE RETOFTITTED TO THE CURRENT SYSTEMS.

(4295) TITLE - TERTIARY TREATMENT OF HOLSTON WASTE WATER

108 85

PROBLEM - FACILITY PROJECT AT HOLSTON REQUIRES TERTIARY TREATMENT TO MEET DISCHARGE STANDARDS FOR NITROBODIES. CARBON ADSORPTION OR A HYBRID TREATMENT SYSTEM IS NEEDED.

SOLUTION - THIS PROJECT WILL COMPLETE PILOT WORK TO ESTABLISH DESIGN CRITERIA AND OBTAIN DATA FOR THE TERTIARY TREATMENT SYSTEM.

(4489) TITLE - ADVANCED POLLUTION ABATEMENT FOR DARCOM FACILITIES

1778 1232 334

PROBLEM - MUCH WORK HAS BEEN DONE IN THE PROPELLANTS AND EXPLOSIVES PLANTS TO MEET THE POLLUTION ABATEMENT STANDARDS. HOWEVER, ALL OF THE GOALS HAVE NOT YET BEEN MET.

SOLUTION - DEVELOP TECHNOLOGY TO DISPOSE OF WASTEWATER TREATMENT SLUDGE, TO PROVIDE TERTIARY TREATMENT OF HAAP WASTEWATER, TO TREAT PINK WATER, AIR EMISSION AND DETONATOR WASTE, AND TO PROVIDE ENVIRONMENTAL IMPROVEMENTS FOR NITRATE ESTERS.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROPELLANTS/EXPLOSIVES

(CONTINUED)

(4511) TITLE - DISPOSAL OF FINAL SLUDGE FROM ACID RECOVERY OPERATIONS

304 151

PROBLEM - RECOVERY OF SODIUM NITRATE AFTER HMX/RDX PROD AT HSAAP IS COSTLY AND CAUSES POLLUTION. SODIUM NITRATE RESULTS BECAUSE SODIUM HYDROXIDE IS USED IN THE ACID PLANT TO NEUTRALIZE RESIDUAL NITRIC ACID AND EXPLOSIVES IN THE SPENT ACID.

SOLUTION - USE AMMONIA IN THE FORM OF AMMONIUM ACETATE TO NEUTRALIZE EXCESS NITRIC ACID. AMMONIUM NITRATE SLUDGE WILL BE CATALYTICALLY HYDROGENATED TO DESTROY OTHER RESIDUES. FINAL SOLUTION IS NH_4NO_3 IN WATER AND HAS A VALUE 4 TO 5 TIMES THAT OF SODIUM NITRATE.

COMPONENT -- RECYCLE

(4011) TITLE - POLLUTION ABATE FOR RECYCLE OF MET-ILLUMINANTS

255

PROBLEM - SCRAP PYROTECHNIC COMPOSITION IS DISPOSED BY BURNING CAUSING AIR POLLUTION. ALSO POWDERED MANESIUM IS LOST AND IT IS A CRITICAL MATERIAL IN SHORT SUPPLY.

SOLUTION - NAVY AT CRANE INDIANA HAS COMPLETED R&D WORK ON RECOVERING AND RECYCLING OF POWDERED MAGNESIUM. SIGNIFICANT COST SAVINGS ARE PROJECTED. THIS PROJECT WILL CONDUCT THE REQUIRED PILOT WORK TO SUPPORT FACILITY DESIGN.

(4033) TITLE - CAUSTIC RECOVERY FROM SODIUM NITRATE SLUDGE

153 282

PROBLEM - HOLSTON IS CURRENTLY LOSING \$80 FOR EACH TON OF SODIUM NITRATE BY-PRODUCT SOLD. SODIUM NITRATE IS EXTREMELY DIFFICULT TO DISPOSE OF BECAUSE OF COMPETITION FROM OTHER FERTILIZERS ON THE MARKET.

SOLUTION - CONVERT SODIUM NITRATE INTO SODIUM HYDROXIDE FOR REUSE IN SPENT ACID RECOVERY OPERATIONS AT HOLSTON. A SUBSTANTIAL COST BENEFIT RESULTS BY REDUCING THE AMOUNT OF NEW SODIUM HYDROXIDE SOLUTION TO BE PURCHASED.

(4344) TITLE - EST WASTE DISPOSAL TECH FOR M687 BINARY PROJ FAC

108 200 380

PROBLEM - LARGE QUANTITIES OF SOLID WASTES ARE GENERATED DURING OF MFG. THERE IS NO ACCEPTABLE DISPOSAL METHOD. DRUM STORAGE IS NOT FEASIBLE AND LANDFILL MAY REQUIRE SPECIAL PREPARATION.

SOLUTION - DEVELOP PROCEDURES FOR DECREASING THE AMOUNT OF SOLID WASTE GENERATED. RECOVER WASTES IN THE FORM OF LIQUID HCL WHICH CAN BE USED IN THE CENTRAL LMT FACILITY AND RECYCLE STILL BOTTOMS WHICH WILL REDUCE SOLID WASTES BY 80 PERCENT.

* C A T E G O R Y *

PROPELLANTS

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- BALL

(43700) TITLE - NITROCELLULOSE & NITROGLYCERINE RECOVERY FROM SCRAP PROP

PROBLEM - THERE ARE LARGE QUANTITIES OF EXCESS OF SCRAP DOUBLE BASE PROPELLANT CURRENTLY BACKLOGGED FOR DISPOSAL. THE NORMAL DISPOSAL METHOD IS BURNING WHICH CAUSES AIR POLLUTION.

SOLUTION - DEVELOP A PROCESS TO SAFELY AND ECONOMICALLY RECOVER THE NITROCELLULOSE AND IF POSSIBLE, THE NITROGLYCERINE CONTAINED IN THE DOUBLE BASE PROPELLANTS. THESE MATERIALS COULD THEN BE USED IN THE PRODUCTION OF BALL PROPELLANT.

255 1010

(4540) TITLE - CALCIUM CARBONATE COATING OF 7.62MM BALL PROPELLANTS

PROBLEM - A SAFE AND EFFICIENT PROCESS IS NOT CURRENTLY AVAILABLE FOR THE COATING OF 7.62MM BALL PROPELLANT WITH CALCIUM CARBONATE.

SOLUTION - UTILIZE AN EXISTING TWO-STAGE CONTINUOUS PILOT SCALE COATER AT OLIN'S ST. MARKS, FL FACILITY TO DEVELOP A SAFE AND EFFICIENT PROCESS TO COAT 7.62MM BALL PROPELLANT WITH CALCIUM CARBONATE.

250 90

COMPONENT -- BENITE

(4210) TITLE - DRY CUTTING OF ENERGETIC MATERIALS

PROBLEM - BENITE STRANDS ARE CUT TO REQUIRED LENGTHS USING A MILLING MACHINE WITH TWO CIRCULAR SAWS. THIS IS UNDULY COSTLY BECAUSE OF EXCESSIVE HANDLING, AND ADDITIONAL DRYING AND INSPECTION OPERATIONS.

SOLUTION - INITIATE HIGH PRESSURE WATER IN FORM OF A FINE JET STREAM TO CUT BENITE STRANDS. THIS WILL REDUCE THE NUMBER OF OPERATIONS, ELIMINATE BUNDLING, TYING/UNTYPING OPERATIONS, AND REDRYING WILL BE MINIMIZED.

449 52

COMPONENT -- GENERAL

(0013) TITLE - EMERGING PROPELLANT MFG TECHNOLOGY

PROBLEM - MANY PROCESSES FOR MANUFACTURE OF PROPELLANTS USE TECHNIQUES DEVELOPED DURING WORLD WAR II. SUCH PROCESSES INVOLVE COSTLY BATCH-TYPE, LABOR INTENSIVE OPERATIONS. THESE METHODS ARE EXCESSIVE ENERGY USERS AND POLLUTION CONTRIBUTORS.

SOLUTION - DEVELOP MORE EFFICIENT, COST EFFECTIVE PROPELLANT PRODUCTION PROCESSES UTILIZING CONTINUOUS AND AUTOMATED ADVANCED TECHNOLOGY. BENEFITS INCLUDE REDUCED LABOR, POLLUTION, AND ENERGY CONSUMPTION.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(CONTINUED)

(4145) TITLE - CONTROL DRYING IN AUTO SB AND BALL PROP MFG

327 553

PROBLEM - OFF-LINE ANALYSIS FOR MOISTURE AND VOLATILES MAKES IT DIFFICULT TO CONTROL A CONTINUOUS DRYING OPERATION SINCE THE TIME REQUIRED FOR ANALYSIS IS LONG COMPARED TO THE RESIDENCE TIME FOR THE PROPELLANT IN A CONTINUOUS DRYER.

SOLUTION - USE PRODUCT TEMPERATURE AND/OR ON-LINE ANALYZERS AND FLOW METERS AS A BASIS FOR IMPROVED CONTROL OF A CONTINUOUS DRYING OPERATION AND REDUCE THE AMOUNT OF OFF-LINE ANALYSIS REQUIRED.

(4273) TITLE - AUTO PRODUCTION OF STICK PROPELLANT

838 770

PROBLEM - PRESENT BATCH TECHNIQUES FOR STICK PROPELLANT MFG INVOLVE MUCH HAND LABOR THEREBY RESULTING IN LIMITED PRODUCTION CAPACITY, HIGH COST, AND HAZARD EXPOSURE.

SOLUTION - INSTALL AND EVALUATE PROTOTYPE EQUIPMENT TO AUTOMATICALLY PRODUCE RACKED SOLVENT-TYPE STICK PROPELLANT, WHICH WILL BE CUT BY FLUID JET CUTTER. THIS PROCESS WILL OPERATE WITH EXISTING 12 INCH PRESS AND PRESS BAY.

(4503) TITLE - LOVA PROPELLANT MANUFACTURING PROCESS

700 1141 875

PROBLEM - VUL OF PROP TO VAR ATTACK FORCES CONTRIB MAJOR PORTION OF PROBABILITY OF LOSING A FIRING VEHICLE. VUL OF BULK PROPELLANT IN COMPLETE ROUND ASSEMBLY, STORAGE OR TRANSPORT IS ALSO A PROBLEM. THIS CHARAC IS INHERENT IN CURRENT MULTIBASE FORMULATION

SOLUTION - CLASS OF PROP UTIL NITRAMINES REDUCES PROB TO ACCEPT LEVELS. A PROCESS F/MFG OF LOVA PROP * AN INERT BINDER BE DEV. PILOT SCALE PROCESS EQUIP BE ASSEMBLED TO PROV AN EMERGETIC PROP IN OPTIMUM GEOMETRIC CONFIG F/BALLISTIC EVAL IN SPEC APPLICATIONS.

COMPONENT -- MISCELLANEOUS

(1019) TITLE - CONVERSION OF SURPLUS PENTABORANE TO B10

196

PROBLEM - THE DIBORANE (B2) USED IN THE MANUFACTURE OF DECABORANE (B10) IS A COST DRIVER.

SOLUTION - DEVELOP A PROCESS TO MIX GOVERNMENT OWNED PENTABORANE (B5) WITH B2 TO REDUCE THE COST OF THE PRODUCT B10.

COMPONENT -- MULTI-BASE

(4512) TITLE - AUTOMATED DIE CUTTER FOR 12-INCH PRESS

PROBLEM - PRODUCTION OF DOUBLE- AND TRIPLE-BASE GRANULAR PROPELLANT REQUIRE EXTRUSION OF STRANDS INTO COMPARTMENTS ON A BUGGY. THE STRANDS ARE MANUALLY FED TO A CUTTER AND THE GRAINS ARE PLACED IN DRYING TRAYS. THIS PROCESS REQUIRES NUMEROUS PERSONNEL.

SOLUTION - DEVELOP A PROTOTYPE CUTTING AND MATERIAL HANDLING SYS OF AUTOMATIC CUTTERS MOUNTED BELOW THE PRESS WHICH FEED, MEASURE, AND CUT THE INDIVIDUAL STRANDS TO THE DESIRED LENGTH. THE CUT GRAINS DROP INTO CONTAINERS FOR MOVEMENT TO A TRAYING STATION.

(4531) TITLE - CONTINUOUS PRODUCTION OF NEW PROPELLANTS ON CAMBL

PROBLEM - VARIOUS HIGH ENERGY AND LOVA GRANULAR AND STICH MULTI-BASE PROPELLANTS ARE BEING DEVELOPED. BATCH FACILITIES FOR MULTI-BASE PROPELLANTS HAVE A CONSTRAINED CAPACITY. A NEW CAMBL HASN'T BEEN PROVEN ACCEPTABLE ON THE NEWER PROPELLANTS.

SOLUTION - ADAPT RECENTLY DEVELOPED CAMBL PROCESS TO DEMONSTRATE THE MASS PRODUCIBILITY OF THE NEW PROPELLANTS. THIS WILL INSURE A PRODUCTION BASE FOR THE NEW FORMULATIONS AND PREVENT HAVING TO USE AND/OR BUILD INEFFICIENT BATCH FACILITIES.

(4544) TITLE - DEVELOP A THIRD GENERATION DYNAGUN TO SIMULATE TANK GUNS

PROBLEM - STANDARD BALLISTIC EVALUATION TESTS ARE THE ONLY MEANS AVAILABLE FOR ASSESSING PROPELLANTS FOR HIGH PRESSURE/HIGH VELOCITY SYSTEMS SUCH AS THE 105MM AND 120MM TANK GUNS. THESE PROCEDURES ARE VERY EXPENSIVE AND TIME CONSUMING.

SOLUTION - DEVELOP A THIRD GENERATION DYNAGUN WHICH CAN BE USED IN LIEU OF STANDARD BALLISTIC TESTS AS A MORE RAPID AND LESS COSTLY MEANS OF ASSESSING PROPELLANTS FOR THE 105MM AND 120MM TANK GUNS.

COMPONENT -- NITROCELLULOSE

(D019) TITLE - PROCESS FOR MFG OF CELLULOSE NITRATE SHEETSTOCK

PROBLEM - THE ARMY INTENDS TO PROCURE THE MFG RIGHTS TO THE UK MORTAR ROUND WHICH USES CN SHEETSTOCK. THE CURRENT PRODUCTION METHOD OF CASTING THE CN INTO BLOCKS AND SLICING THE BLOCKS INTO SHEETS IS TIME CONSUMING AND LABOR INTENSIVE.

SOLUTION - INVESTIGATE OTHER METHODS OF MANUFACTURE, DETERMINE FEASIBILITY AND PROVIDE EQUIPMENT TO AUTOMATE THE SHEETSTOCK MANUFACTURING PROCESS.

250 760 810

350 315

200 500

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- NITROCELLULOSE

(CONTINUED)

(4341) TITLE - IMPROVED NITROCELLULOSE PURIFICATION

1642 765

PROBLEM - EXISTING NITROCELLULOSE PURIFICATION FACILITIES WERE BUILT IN EARLY 1940'S AND ARE IN DETERIORATED CONDITION. THE PROCESS USED DATES BACK TO WWI AND CONSUMES LARGE QUANTITIES OF ENERGY AND WATER.

SOLUTION - SELECT AND DEVELOP A NITROCELLULOSE PURIFICATION PROCESS TO BE USED IN THE MODERNIZATION PROGRAM WHICH IS MORE ENERGY AND WATER EFFICIENT. THE METHOD SELECTED IS BASED ON THE SWISS CONICELL PROCESS AS A RESULT OF THE FY77 EFFORT.

(4514) TITLE - NONCONFINING NITRATING ACID REMOVAL

70 635 675

PROBLEM - THE CONTINUOUS NITRATION PROCESS USES A CONTINUOUS COUNTER CURRENT WASH TYPE CENTRIFUGE. OPERATIONAL DIFFICULTIES CAN LEAD TO AN EXCESSIVE AND UNSAFE ACCUMULATION AND CONFINEMENT OF ACID WET UNSTABLE NITROCELLULOSE.

SOLUTION - CONDUCT A SURVEY OF EQUIPMENT FOR OFF-THE-SHELF AVAILABILITY. MINIMIZE FLOOR AREA REQUIREMENTS TO AVOID ADDITIONAL BUILDING REQUIREMENTS. PROCURE, INSTALL, AND EVALUATE THE EQUIPMENT SELECTED OR DESIGNED.

COMPONENT -- NITROGUANIDINE

(4059) TITLE - NO CRYSTALLIZATION FOR CONTINUOUS PROP LINES

271 190

PROBLEM - NITROGUANIDINE PRODUCED ON THE NEW LINE AT SUNFLOWER AAP IS EXPECTED TO HAVE A DIFFERENT PARTICLE SIZE DISTRIBUTION THAN THAT OF PREVIOUS SUPPLIER. THIS MAY CREATE PROCESSING PROBLEMS IN THE NEW CONTINUOUS AUTOMATED MULTI-BASE LINE (CAMBL) PROCESS.

SOLUTION - THIS PROJECT IS TO QUALIFY THE NITROGUANIDINE PRODUCED AT SUNFLOWER AAP ON THE CAMBL PROCESS AT RADFORD AAP AND DETERMINE IF THERE WILL BE ANY SERIOUS PROCESSING PROBLEMS.

(4061) TITLE - NITROGUANIDINE PROCESS OPTIMIZATION

260 905 925 872

PROBLEM - A NITROGUANIDINE FACILITY IS UNDER CONSTRUCTION AT SAAP TO BE OPERATIONAL IN FY80. IT UTILIZES PROCESSES NOT PREVIOUSLY USED COMMERICALLY AND IT CONTAINS MANY RECIRCULATION AND SUPPORT LOOPS, THE OPERATION OF WHICH ARE STRONGLY INTERDEPENDENT.

SOLUTION - CONDUCT PROCESS IMPROVEMENT PROCEDURES USING NITROGUANIDINE SUPPORT EQUIPMENT (NSE) INSTALLED UNDER PROJECT 5752632, AND APPLY EVOLUTIONARY OPERATION (EVOP) TO THE NITROGUANIDINE FACILITY BEING CONSTRUCTED AT SUNFLOWER APP.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- NITROGUANIDINE

(CONTINUED)

(4427) TITLE - ON-LINE ANALYZERS FOR NITROGUANIDINE PLANT

412

PROBLEM - A NITROGUANIDINE MFG FACILITY IS BEING CONSTRUCTED AT SUNFLOWER AAP. MMT 5 78 4447 INDICATED THE FEASIBILITY OF AUTOMATED ON-LINE INSTRUMENTATION FOR PROCESS STREAM CHEMICAL ANALYSIS. HOWEVER THE RELIABILITY HAS NOT BEEN DEMONSTRATED.

SOLUTION - INSTALL AND EVALUATE AN ON-LINE ION CHROMATOGRAPH, A GAS CHROMATOGRAPH, AND A SPECTROPHOTOMETER IN THE NO SUPPORT EQUIPMENT WHICH IS TO BE OPERATED DURING FY82 UNDER MMT 5 8X 4061, NO PROCESS OPTIMIZATION.

COMPONENT -- SINGLE BASE

(4027) TITLE - SOLVENT RECOVERY/DRYING OF SINGLE BASE PROPELLANTS

337 423

PROBLEM - PRESENTLY SOLVENT RECOVERY, WATER DRY, AND AIR DRY OPERATIONS ARE ACCOMPLISHED IN 3 SEPARATE TANKS. ONE TANK IS USED FOR EACH OPERATION. THESE OPERATIONS ARE BOTH LABOR AND ENERGY INTENSIVE AND GENERALLY INEFFICIENT.

SOLUTION - COMBINE THE 3 SEPARATE OPERATIONS INTO ONE COMBINED OPERATION TO TAKE PLACE IN ONE MODIFIED SOLVENT RECOVERY TANK. THIS APPROACH WILL RESULT IN A SIGNIFICANT SAVINGS IN BOTH LABOR AND ENERGY.

COMPONENT -- SOLVENTLESS

(3711) TITLE - PROCESS FOR DEPOSITION OF PROPELLANT ON A SCREEN SUBSTRATE

315 1010

PROBLEM - NO PROCESS OR MANUFACTURE CAPACITY EXISTS FOR THE VOLUME PRODUCTION OF UNUSUAL PROPELLANT CONFIGURATION WHICH INVOLVES COATING A PLASTIC SCREEN WITH PROPELLANT. THIS CONFIGURATION IS BEING CONSIDERED FOR A NEW ANTI-TANK ROUND.

SOLUTION - ADAPT EXISTING FACILITIES TO MEET SAFETY AND PRODUCTION REQUIREMENTS AUTOMATING AREAS AS REQUIRED.

* C A T E G O R Y *

*QUALITY CONTROL/TESTING *

COMPONENT -- INSPECTION

(4103) TITLE - AUTO LINK INSPECTION EQPT SYSTEM (ALIES)

319 542

PROBLEM - CURRENT MANUAL INSPECTION METHODS FOR SMALL ARMS AMMUNITION LINKS ONLY PROVIDES FOR A SAMPLING OF LESS THAN ONE PERCENT OF OUTGOING LINKS. NON- CONFORMING LINKS CAUSE COSTLY LOADING MACHINE JAMS.

SOLUTION - THIS PROJECT WILL DEVELOP AND BUILD AN AUTOMATED LINK INSPECTION SYSTEM. THE SYSTEM WILL TEST AND INSPECT CRITICAL AND MAJOR FEATURES OF EACH M13 LINK PRODUCED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- INSPECTION (CONTINUED)

(4357) TITLE - FLUX LEAKAGE INSPECTION SYSTEM FOR M483

124

556

PROBLEM - THERE IS NO NONDESTRUCT INSPECTION METHOD WITH FLOW DETECTION RELIABILITY ESTAB F/M483. A MAGNETIC FLUX LEAKAGE DEVICE PURCHASED F/LOUISIANA AAP DEMONSTRATED FEAS BUT COST OF OPERATION MUST BE DETERMINED.

SOLUTION - DESIGN DEVELOP AND FABRICATE A PROTOTYPE MFL INSP SYS + EVALUATE RELIABILITY + OPERATING COST COMPARED TO ULTRASONIC INSPECTION SYSTEMS.

(4358) TITLE - AUTO LINE - PROCESS INSPECTION OF NEW EED'S (ALPINE)

450

345

325

PROBLEM - INSPECTION OF BRIDGE WIRE ON ELECTRIC DETONATORS.

SOLUTION - AUTOMATE THE TESTING TECHNOLOGY DEVELOPED BY TTT ARRADCOM 12-78, *ELECTROTHERMAL ANALOG RESPONSE INSPECTION OF EED'S* FOR FINAL END ITEM NONDESTRUCTIVE ACCEPTANCE INSPECTION.

(4359) TITLE - IMPROVE PROCESS TECHNOLOGY F/INSPECTION OF CLOTH

215

PROBLEM - REDUCE TIME AND COST OF VISUAL INSPECTION OF CLOTH USED IN PROPELLANT BAGS, FLASH REDUCERS, ADDITIVE LINERS AND IGNITER PADS.

SOLUTION - IMPLEMENT EQUIP PROVEN FEASIBLE. PROCURE + INSTALLATION OF MOD STATE-OF-ART SENSORS THAT WILL MARK LOCATION OF CLOTH DEFECTS DURING SLITTING OPERATION. CLOTH WILL BE REMOVED + DISCARDED PRIOR TO SUBSEQUENT SEWING OPERATIONS.

(4471) TITLE - CONICAL SURFACE INSPECTION

150

PROBLEM - NO SATISFACTORY AUTOMATED INSPECTION EQUIPMENT IS KNOWN TO ACCOMPLISH THE VARIOUS CONICAL SURFACE INSPECTIONS FOR CONVENTIONAL AND ADVANCED SHAPED CHARGE LINERS.

SOLUTION - PROVIDE AN AUTOMATED INSPECTION SYSTEM COMPATIBLE WITH PROPOSED CONVENTIONAL AND SHAPED CHARGE TECHNOLOGY PROGRAMS. SPECIFICALLY FOR CONICAL SURFACE MEASUREMENTS.

COMPONENT -- NON-DESTRUCTIVE TESTING

(3719) TITLE - APPLICATION OF X-RAY SYSTEM SCANNER 100 PCT

2200

PROBLEM - IN THE CURRENT METHOD OF TESTING THE METALLURGICAL PROPERTIES OF SHELL, DESTRUCTIVE SAMPLES MUST BE TAKEN CONTINUOUSLY IN PRODUCTION

SOLUTION - DEVELOP A RAPID AND EFFECTIVE NDT METHOD TO CONTINUOUSLY VERIFY THE TENSILE AND HARDNESS PROPERTIES OF EACH SHELL PRODUCED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- NON-DESTRUCTIVE TESTING

(CONTINUED)

(4431) TITLE - SHELL HOLOGRAPHIC INSPECTION AND EXAMINATION LINE DEVICE

581 163

PROBLEM - THERE IS NO COMPLETE AUTOMATIC NON-DESTRUCTIVE INSPECTION SYSTEM FOR TESTING SHELLS AT 100 PERCENT PRODUCTION RATE.

SOLUTION - DEVELOP A PRODUCTION PROTOTYPE HOLOGRAPHIC SYSTEM TO AUTOMATICALLY INSPECT ENTIRE 155MM M483A1 MPT PROJECTILES.

(4473) TITLE - AUTO LEAK DETECTION OF WP MUNITIONS

809

PROBLEM - THE CURRENT METHOD OF HEATING THE WHITE PHOSPHOROUS MUNITIONS TO CHECK FOR LEAKS IS LABOR INTENSIVE AND IS NOT UNIFORM FOR ALL ROUNDS.

SOLUTION - PROVIDE A PROTOTYPE AUTOMATED IN-LINE LEAK DETECTION SYSTEM BASED ON QUANTITATIVE FLAME PHOTOMETRY. THE SYSTEM WILL CONSIST OF TWO HEATING STAGES, A SAMPLING WHEEL, LEAK DETECTOR AND HANDLING SYSTEM.

(4546) TITLE - NDT FOR BONDED AREAS OF 60/80MM MORTAR INCREMENT CONTAINERS

175 175

PROBLEM - LACK OF NONDESTRUCTIVE TEST OR INSPECTION OF THE BONDING OF THE CONTAINER HALVES AND THE CLOSURE OF FILLING HOLE.

SOLUTION - DEVELOP NDT AND EQUIPMENT FOR AUTOMATIC 100 PERCENT INSPECTION OF THE INCREMENT CONTAINER BONDED AREA. THE FEASIBILITY OF OPTICS TECHNOLOGY WILL BE INVESTIGATED FOR PRACTICALITY WHICH WILL BE FOLLOWED BY EQUIPMENT DESIGN AND FABRICATION.

COMPONENT -- SIMULATION

(2856) TITLE - SHOCK IMPULSE HYDROSTATIC TESTING

205

PROBLEM - BALLISTIC ACCEPT TEST OF METALLIC CARTRIDGE CASES UTILIZES 100 SAMPLE ITEMS LOADED INTO COMPLETE ROUNDS * FIRED AT A PG. THIS TEST CONSTITUTES APPROX 50 PERCENT OF ALL BALLISTIC ACCEPT TEST DONE ON ENTIRE ROUND REQUIRED TO PRODUCT ROUND.

SOLUTION - A SHOCK IMPULSE HYDROSTATIC PRESSURE TESTER DEV TO TEST COMPONENT CARTRIDGE CASE IN-PLANT W/O NEED OF ASSEMBLING INTO A FULL-UP ROUND WHILE STILL SIMULATING INTERIOR BALLISTIC PULSE WILL MINIMIZE EXPENSE OF TESTING BALLISTICALLY.

COMPONENT -- X-RAY

(4454) TITLE - AUTOMATIC INSPECTION DEVICE EXPLOSIVE CAST IN SHELL

3374 1885 312

PROBLEM - THE PRESENT METHOD OF INSPECTION LOADED PROJECTILE UTILIZES A STANDARD RADIOGRAPHIC FILM METHOD. LABOR AND MATERIAL (FILM) ARE COSTLY. DETERMINATION OF CRITICAL DEFECT IS SUBJECT TO HUMAN JUDGEMENT, FATIGUE, AND ERROR.

SOLUTION - DEVELOP PROTOTYPE SYSTEM USING A MINI-COMPUTER TO ANALYZE X-RAY IMAGES TO AUTOMATICALLY ACCEPT OR REJECT GROUPS OF HE FILLED PROJECTILES. DEVELOP A PROTOTYPE FILMLESS REAL-TIME AUTOMATED INSPECTION SYSTEM.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- X-RAY

(CONTINUED)

(4545) TITLE - DIGITAL IMAGE AMPLIFICATION X-RAY SYSTEM

737 299

PROBLEM - EXISTING IMAGE AMPLIFICATION X-RAY DOES NOT MEET THE IMAGE QUALITY CRITERIA TO BE USED AS AN INSPECTION TOOL FOR HE MORTAR ROUNDS. FILM RADIOGRAPHY, AS CURRENTLY USED, IS LABOR INTENSIVE, TIME CONSUMING, AND SUBJECT TO HUMAN INTERPRETIVE JUDGEMENT.

SOLUTION - REPLACE WITH AN IMPROVED REAL-TIME IMAGE AMPLIFICATION SYSTEM. TECHNIQUES FOR DIGITAL IMAGE ENHANCEMENT AND ANALYSIS DEVELOPED UNDER THE AXIS PROJECT WILL BE ADOPTED.

* C A T E G O R Y *

* SAFETY *

COMPONENT -- GENERAL

(2741) TITLE - ADVANCE LIGHTNING PROTECTION TECHNIQUES TO AAP'S

150

PROBLEM - AS THE ELECTRONICS ADOPTED IN THE DESIGN OF AAP'S BECOMES MORE SOPHISTICATED AND COSTLY, THE NEED FOR QUICK AND RELIABLE LIGHTNING PROTECTION INCREASES.

SOLUTION - IMMEDIATE EVALUATION OF AUSTRALIAN (E.F. AUSTRALASIA) LIGHTNING PROTECTION SYSTEM AND SUBSEQUENT STATE OF THE ART ADVANCEMENT.

(4071) TITLE - EXPLOS PREVENTION IN DRY DUST COLLECTION SYSTEMS

288 442 200

PROBLEM - POTENTIALLY HAZARDOUS CONDITIONS EXIST IN DRY DUST COLLECTION SYSTEMS THROUGHOUT THE MUNITIONS PRODUCTION BASE. PRESENT DATA ON DETONATION CHARACTERISTICS OF EXPLOSIVE, PROPELLANT OR PYROTECHNIC DUST ARE INCOMPLETE/INADEQUATE TO IMPROVE SAFETY.

SOLUTION - DEVELOP DATA TO ESTABLISH SAFE OPERATING PARAMETERS FOR DUST COLLECTION SYSTEMS. UTILIZE THESE DATA TO DEVELOP FAIL-SAFE COLLECTION SYSTEM DESIGNS WHICH PREVENT DUST EXPLOSIONS BY EMPLOYMENT OF PROPER VENTING, LIMITING IGNITION ENERGY, ETC.

(4291) TITLE - BLAST EFFECTS IN THE MUNITIONS PLANT ENVIRONMENT

1373 359

PROBLEM - MOST OF THE DESIGN EFFORT IS IN THE AREA OF LACE REINFORCED STRUCTURES FOR CLOSED IN AREAS TO AN EXPLOSION. WE MUST ATTEMPT TO UTILIZE COM CONSTRUCTION MATERIAL.

SOLUTION - TO STUDY CHARACTERISTICS OF THE BLAST ENVIRONMENT AND DETERMINE THE RESPONSE OF THE VARIOUS STRUCTURAL MATERIALS AND ELEMENTS SUBJECTED TO THESE LOADING.

COMPONENT -- LAP

(4374) TITLE - EXPLOSIVE SAFETY SHIELDS

193

PROBLEM - ACRYLIC MATL IS USED AS A PROTECTIVE SHIELD ON LOADING LINES WHERE LOADING OF SMALL QUANT OF HIGHLY SENSITIVE EXPLOSIVE OCCURS. NO DATA ON BLAST CAP OF THE MATL IS AVAIL + WORK MUST BE DONE ON A CASE-BY-CASE BASIS.

SOLUTION - DETERMINE BLAST CAP OF ACRYLIC MATLS + PREP DESIGN GUIDANCE F/FUTURE USE. TECH REPORTS FOR DESIGN GUIDANCE OF THIS TYPE OF PROTECTIVE SHIELDS WILL BE DEV TO PRECLUDE CASE-BY-CASE METHOD NOW USED.

(4429) TITLE - IMPROVED SAFETY OF SCALE WEIGHING EQUIPMENT

377

PROBLEM - ELECTRONIC CONTROLS FOR WEIGHING SYSTEMS DO NOT MEET THE NATIONAL ELECTRICAL CODE STANDARDS AND OPERATE PRESENTLY UNDER EXCEPTIONS TO THE CODE.

SOLUTION - SCALE TRANSDUCERS WILL BE STUDIED AND SPECIFICATIONS OF THE VARIOUS COMPONENTS WILL BE REVIEWED. COMMERICALLY AVAILABLE COMPONENTS WILL BE CONFIGURED TO ACHIEVE AN INTRINSICALLY SAFE TRANSDUCER.

COMPONENT -- PROPELLANTS/EXPLOSIVES

(4285) TITLE - TNT EQUIV TESTING FOR SAFETY ENGINEERING

251

PROBLEM - PRESENT CRITERIA FOR BLAST RESISTANT STRUCTURES IS IN TERMS OF SURFACE BURST OF HEMISPHERICAL TNT. IN STRUCTURAL DESIGN, TO PROTECT FROM THE OUTPUT OF OTHER ENEGETICS, THE DESIGNERS MUST HAVE DATA PERTINENT TO THE MATERIAL IN QUESTION.

SOLUTION - BY TESTING TO GENERATE PEAK PRESSURE AND POS IMPULSE DATA FROM BLAST MEASUREMENTS OF HIGH ENERGY MATERIALS IS GENERATED. THESE RESULTS ARE COMPARED WITH THE BLAST OUTPUT OF HEMISPHERICAL TNT TO DETERMINE THE TNT EQUIVALENCY OF THE MATERIAL.

(4288) TITLE - EXPLOSIVE SAFE SEPARATION AND SENSITIVITY CRITERIA

720

PROBLEM - DATA IS REQUIRED TO UPGRADE PROCESSES AND MATERIAL FOR THE MAXIMUM SAFETY OF PERSONNEL AND EQUIPMENT AGAINST EXPLOSION PROPOGATION.

SOLUTION - TESTS WILL BE DESIGNED AND CONDUCTED FOR EXPLOSIVES AND END ITEMS TO DETERMINE THE SAFE SEPARATION DISTANCE AND THE EXPLOSIVE DEPTH ON CONVEYORS.

(4318) TITLE - OCCUPATIONAL EXPOSURE TO NITRATE ESTERS IN MUNITION MFG

450

PROBLEM - THE THRESHOLD LIMIT VALUE FOR NITROGLYCERIN AND OTHER NITRATE ESTERS MAY BE REDUCED FROM 0.2 PPM TO 0.02 PPM. THIS COULD INVOLVE EXTENSIVE REDESIGN ON ALL FACILITY PROJECTS INVOLVING NG OR NITRATE ESTERS.

SOLUTION - UTILIZE MORE EFFECTIVE VENTILATION OR CHEMICAL ENTRAPMENT, REMOTE AUTOMATIVE OPERATIONS, DEVELOP PROTECTIVE CLOTHING AND AIR RESPIRATORS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROPELLANTS/EXPLOSIVES

(CONTINUED)

(4453) TITLE - PROPAGATION DISTANCE FOR ENERGETIC MATERIALS

200

PROBLEM - THE EXISTING SAFETY MANUAL (AMCR 385-100) HAS BECOME ANTIQUATED BY RECENT ADVANCES IN WEAPONS TECHNOLOGY. THERE IS A NEED TO UPGRADE ACCIDENTAL DETONATION SUPPRESSION CRITERIA.

SOLUTION - A SERIES OF PROPAGATION SUPPRESSION CRITERIA TESTS ON VARIOUS ENERGETIC MATERIALS WILL BE CONDUCTED. THE SAMPLE CONFIGURATIONS WILL SIMULATE STAGES OF END ITEM MANUFACTURE AND ASSEMBLY.

(4492) TITLE - WATER DELUGE SYSTEM APPLICATION IN MUNITIONS PLTS

308 296

PROBLEM - INFORMATION ON DELUGE REQUIREMENTS FOR EXTINGUISHING FIRES FROM EXPLOSIVES + PROPELLANTS PRIOR TO THE MATERIALS PROCEEDING TO DETONATION IS NOT AVAILABLE TO THE ARMY. THIS INFORMATION CANNOT BE INTRAPOLATED BETWEEN PROPELLANTS AND EXPLOSIVES.

SOLUTION - WATER DELUGE SYSTEMS WILL BE DEVELOPED TO EXTINGUISH FIRES FROM VARIOUS EXPLOSIVES + PROPELLANTS PRIOR TO DETONATIONS. THIS DATA WILL BE INCORPORATED INTO FIRE EXTINGUISHING MANUALS AND APPLIED TO OLD + NEW CONSTRUCTION IN AMMO PLANTS.

* C A T E G O R Y *

*SMALL ARMS *

COMPONENT -- GENERAL

(S410) TITLE - TRACER BULLET JACKET IMPR MFG PROCESS

250

PROBLEM - TRACER AMMO IS MORE SENSITIVE TO BULLET JACKET DRAW QUALITY THAN STANDARD CARTRIDGE. GILDING METAL CLAD STEEL JACKET DRAW PROCESS REQUIRES IMPROVED TOOL CONTROL, EQUIPMENT AND INCREASED PROCESS SURVEILLANCE.

SOLUTION - EVALUATE DRAW PROCESS TO DETERMINE CRITICAL PROCESS PARAMETERS THAT CONTROL JACKET QUALITY. ENDEAVOR TO ESTABLISH IMPROVED TOOL DESIGN.

(4351) TITLE - IMPROVED STORAGE TECHNOLOGY FOR PRODUCTION MACHINE

421 325 335

PROBLEM - NEED TO OVERCOME DEGRADATION OF ELECTRONIC COMPONENTS + MEET RAPID REACTIVATION OF AUTO PDM LINES F/MOB REQUIREMENTS.

SOLUTION - DEVELOP PACKAGING TECHNIQUE AND USE OF DRY NITROGEN FOR SCAMP EQUIPMENT.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(CONTINUED)

(4464) TITLE - COMPUTER/GROUP TECHNOLOGY FOR SMALL CAL AMMO

269 225

PROBLEM - PRESENTLY THERE IS NO METHOD TO OPTIMIZE DESIGN OF TOOLING AND TO SELECT PROPER EQUIPMENT FOR SMALL CALIBER AMMO.

SOLUTION - INVESTIGATE POSSIBLE USE OF COMPUTER FOR OPTIMUM TOOL AND EQUIPMENT DESIGN, AND TO PREDICT PROCESS PARAMETERS AND COSTS.

(4539) TITLE - AUTOMATIC CARTRIDGE CASE HARDNESS MEASUREMENT

300 400

PROBLEM - MANUAL MEASUREMENTS BY SAMPLING METHODS ARE INADEQUATE AND COSTLY.

SOLUTION - DIRECT EDDY CURRENT TECHNIQUE WOULD PROVIDE CONTINUOUS AND 100% INSPECTION

COMPONENT -- METAL PARTS

(S411) TITLE - PROCESS F/20MM TUBULAR PROJ F/AIR DEFENSE

145 686

PROBLEM - HIGH VOLUME PRODUCTION PROCESS DOES NOT EXIST FOR METAL PARTS, LOAD ASSEMBLE AND PACK.

SOLUTION - DEVELOP PRODUCTION PROCESS.

(4168) TITLE - DIP SPIN ZINC COATING FOR SMALL CALIBER CASES

148

PROBLEM - CURRENT FINISHING PROCESS FOR BUSHMASTER STEEL CASES CONSISTS OF ZINC ELECTROPLATING, CHROME CONVERSION COATING, POLYAMIDE TOPCOATING, AND WASTE TREATMENT TO CONTROL HAZARDOUS CYANIDES AND HEAVY METAL POLLUTANTS

SOLUTION - ESTABLISH THE ELECTROLESS ZINC COATING PROCESS WHICH CONSISTS OF IMMERSING CLEAN CASES IN A WATER DISPERSION OF ZINC FLAKES, CHROMATES AND SOME SOLVENT. THE PARTS ARE THEN SPUN AND BAKED. NO POLLUTANTS ARE GENERATED

(4459) TITLE - WELDED OVERLAY ROTATING BAND MACH F/SC MUN

340

PROBLEM - HIGH SPEED WELDING MACHINES FOR ROTATING BANDS DO NOT EXIST FOR 20MM - 40MM PROJECTILES.

SOLUTION - DEVELOP WELDING MACHINE.

(4463) TITLE - MACHINING OF BRASS CARTRIDGE CASES

170

PROBLEM - TOOL MORTALITY TO MACHINE EXTRACTOR GROOVE IS EXCESSIVE AND PRODUCES GREAT DEAL OF SCRAP. ALSO HOLDING COMPONENTS IS A PROBLEM.

SOLUTION - FIND ALTERNATE DESIGNS FOR CUTTING TOOLS. INVESTIGATE NEW WAYS TO HOLD COMPONENTS FIRMLY IN PLACE.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- 5.56 - .30 CAL

(3218) TITLE - M200 BLANK CONVERSION SPECIFICATION FOR SCAMP CASE SUBMODULE

PROBLEM - EVALUATE EQUIPMENT FOR MULTIPRODUCT PRODUCTION. MOST LIKELY CANDIDATE IS M200 BLANK.

SOLUTION - ESTABLISH A PROCESS FOR BLANK CASE MANUFACTURING ON SCAMP EQUIPMENT. INCLUDE INVESTIGATION OF KNURLING AND ANNEALING PROCESS REQUIREMENTS.

264 269

COMPONENT -- 5.56MM - .30 CAL

(S407) TITLE - 7.62MM BULLET MFG BY ROLL FORMING

PROBLEM - METHOD TO MANUFACTURE 7.62 UTILIZES SAME PROCESS AS 5.56. IT IS UNCERTAIN WHETHER IT WILL WORK ON 7.62.

SOLUTION - INVESTIGATE OTHER METHODS OF PRODUCING 7.62 BULLET ROLL FORMING APPEARS VERY PROMISING.

250

(2743) TITLE - IMPROVED TECH FOR SMALL CALIBER AMMUNITION

PROBLEM - THE SMALL ARMS MUNITION PRODUCTION BASE MUST KEEP ABREAST OF THE RAPIDLY EMERGING NEW MANUFACTURING TECHNIQUES ON A COST/PRODUCTIVITY BASIS.

SOLUTION - CONTINUALLY MONITOR THE SMALL ARMS DEVELOPMENTS AND APPLICABLE EMERGING MANUFACTURING TECHNOLOGY.

500 1000

(3201) TITLE - MODERNIZED PROCESSES FOR MANUFACTURE OF NATO 5.56MM AMMO

PROBLEM - AN AMERICANIZED VERSION OF BELGIUM SS-109 WILL BE USED IN THE SAW SYSTEM. THIS EFFORT IS DIRECTED TOWARD DEVELOPMENT OF CONVENTIONAL PROCESSES TO MASS PRODUCE SAWS AMMUNITION ON SCAMP EQUIPMENT.

800

SOLUTION - THIS PROJECT WILL DEFINE PROCESSES AND EQUIPMENT/TOOLING CHANGES REQUIRED ON SCAMP LINE. INITIATION OF THESE EFFORTS THIS YEAR WILL PROVIDE PROCESS EQUIPMENT SPECIFICATIONS FOR IMPLEMENTATION IN SUFFICIENT TIME TO MEET FY87 AND ON REQUIREMENTS.

(3213) TITLE - MANUFACTURING PROCESSES FOR 9MM AMMUNITION

PROBLEM - ONLY LIMITED COMMERCIAL CAPACITY EXISTS TO PRODUCE 9MM AMMUNITION. THERE ARE NO GOCO LINES TO SATISFY ANTICIPATED MILITARY REQUIREMENTS.

235 150

SOLUTION - DEVELOP A PROCESS FOR PRODUCTION OF 9MM AMMUNITION UTILIZING AN IN-LINE TRANSFER PRESS FROM A PROTOTYPE 5.56MM LINE. ONE MILLION PARTS WILL BE PRODUCED AND TESTED FOR PROCESS VERIFICATION.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- 5.56MM - .30 CAL

(CONTINUED)

(4150) TITLE - NEW MFG PROCESSES FOR SMALL CAL PENETRATORS

926 211

PROBLEM - MANUFACTURE OF PENETRATORS INTO BALL BULLETS IS VERY COSTLY.

SOLUTION - INVESTIGATE SKEWED AXIS ROLL FORMING OF PENETRATOR AS WELL AS HYBRID SLUGS MANUFACTURING AND FEEDING METHODS. COLD HEADING WILL ALSO BE EVALUATED.

(4503) TITLE - NEW PROCESS FOR SAWS TRACER AMMUNITION

500 129

PROBLEM - THERE IS NO U.S. CAPABILITY FOR MANUFACTURING THE PROPOSED NATO 5.56MM TRACER BULLET IN THE QUANTITIES REQUIRED FOR THE SAW SYSTEM.

SOLUTION - THE CONVENTIONAL SMALL CALIBER TRACER BULLET MANUFACTURING EQUIPMENT WILL BE MODIFIED TO PRODUCE THE NATO TRACER BULLET.

(4506) TITLE - 5.56MM CARTRIDGE LINKING SYSTEM

558 577

PROBLEM - THERE ARE CURRENTLY NO LINKING MACHINES AVAILABLE FOR LINKING PRODUCTION QUANTITIES OF 5.56MM AMMUNITION. THE MANUAL AND SEMI-MANUAL METHODS AVAILABLE ARE SLOW AND COSTLY.

SOLUTION - LINKING MACHINES FOR 7.62MM AMMUNITION DO EXIST. A MODIFICATION AND IMPROVEMENT SHOULD PROVIDE A SATISFACTORY SOLUTION. A PRODUCTION RATE OF 65.8 MILLION ROUNDS PER YEAR IS REQUIRED.

(4536) TITLE - MANUFACTURE OF FRANGIBLE TRAINING AMMUNITION

380 170

PROBLEM - FRANGIBLE BULLET (M160) WAS DEVELOPED IN MID-1940'S. AN EFFORT IS REQUIRED TO EXPLORE PROCESSES TO ACHIEVE A LOW COST PRODUCTION CAPABILITY.

SOLUTION - DEVELOP APPROPRIATE PROCESS EQUIPMENT FOR PRODUCTION OF QUALITY PROJECTILES. THE PROTOTYPE AND PROCESS DEVELOPMENT EFFORT WILL ESTABLISH COST EFFECTIVE TECHNOLOGY FOR PROJECTILE MANUFACTURE, CARTRIDGE, ASSEMBLY, AND MATERIAL HANDLING TECHNIQUES.

(4538) TITLE - 5.56MM SAWS LINK ORIENTOR AND FEED SYSTEM

406

PROBLEM - THE M27 LINKS ARE MANUALLY ORIENTED AND PACKED AT THE LINK MANUFACTURERS. AT THE LOADING PLANT, LINKS MUST BE MANUALLY UNPACKED AND FED INTO THE LINKING MACHINES, WHICH IS TIME CONSUMING AND COSTLY.

SOLUTION - BY DEVELOPING RANDOM ORIENTOR EQUIPMENT, THE LINK MANUFACTURERS WILL BE ABLE TO SHIP LINKS IN BULK TO THE LOADING PLANT; THUS, ELIMINATING MANUAL PACKING, UNPACKING, AND COST OF CARTONS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- 5.56MM - .30 CAL

(CONTINUED)

(4541) TITLE - AUTO PRIMER INSERT LACQUER AND ANVIL PRESENCE INSPECT SYS

565 245

PROBLEM - LACQUER INSPECTION AT GAGE & WEIGH IS BEING ELIMINATED. THE PRIMER INSERT SUBMODULE CURRENTLY INSPECTS FOR PRIMER ANVIL WITH A PROBE. TO IMPROVE EFFICIENCY, A BACK-UP INSPECTION IS DESIRED CAPABLE OF BEING INSTALLED ON EXISTING EQUIPMENT.

SOLUTION - A FLORESCENT DYE WILL BE ADDED TO THE PRIMER LACQUER TO BE DETECTED BY TWO DETECTORS. THE BACK-UP INSPECTION OF PRIMER ANVIL WILL BE EVALUATED BY USING A NONCONTACT EDDY CURRENT PROBE.

(4551) TITLE - MFG PROCESS PARAMETERS FOR XM855/856 AMMO

513

PROBLEM - THE ARMY IS DEVELOPING A PRODUCTION BASE FOR THE NATO 5.56MM AMMUNITION. HOWEVER, THERE IS NO PROCESS UNDER WHICH U.S. PRODUCED ROUNDS CAN BE PROVEN OUT FOR ACCEPTABILITY OF PERFORMANCE OR THE SUITABILITY OF THE MANUFACTURING TOOLING AND PROCESSES.

SOLUTION - PROCURE QUANTITIES OF XM855/856 AMMUNITION FROM LCAAP PRODUCED BY THE NEWLY DEVELOPED PROCESS AND TDP FOR TECHNICAL EVALUATION AND PRODUCT/TOOLING ACCEPTABILITY.

COMPONENT -- .50 CAL AND LARGER

(S021) TITLE - HOT FORMING OF P/M PROJ BODIES

170

PROBLEM - CURRENT METHODS OF FABRICATING CANNON CALIBER ROUNDS REQUIRES EXTENSIVE MACHINING TO REMOVE 60-70 PERCENT OF THE STARTING MATERIAL.

SOLUTION - FABRICATE PROJECTILE BODIES BY UTILIZING POWDER METALLURGY (P/M) HOT FORMING INTO THE DESIRED SHAPE.

(3205) TITLE - PRODUCTION PROCESS FOR CALIBER .50 PLASTIC BLANK AMMUNITION

300 800

PROBLEM - CURRENTLY, THERE IS NO PRODUCTION EQUIPMENT FOR MANUFACTURING OF HIGH PLASTIC CASE COMPONENTS AND LOADING TO MEET ANTICIPATED HIGH PRODUCTION REQUIREMENTS.

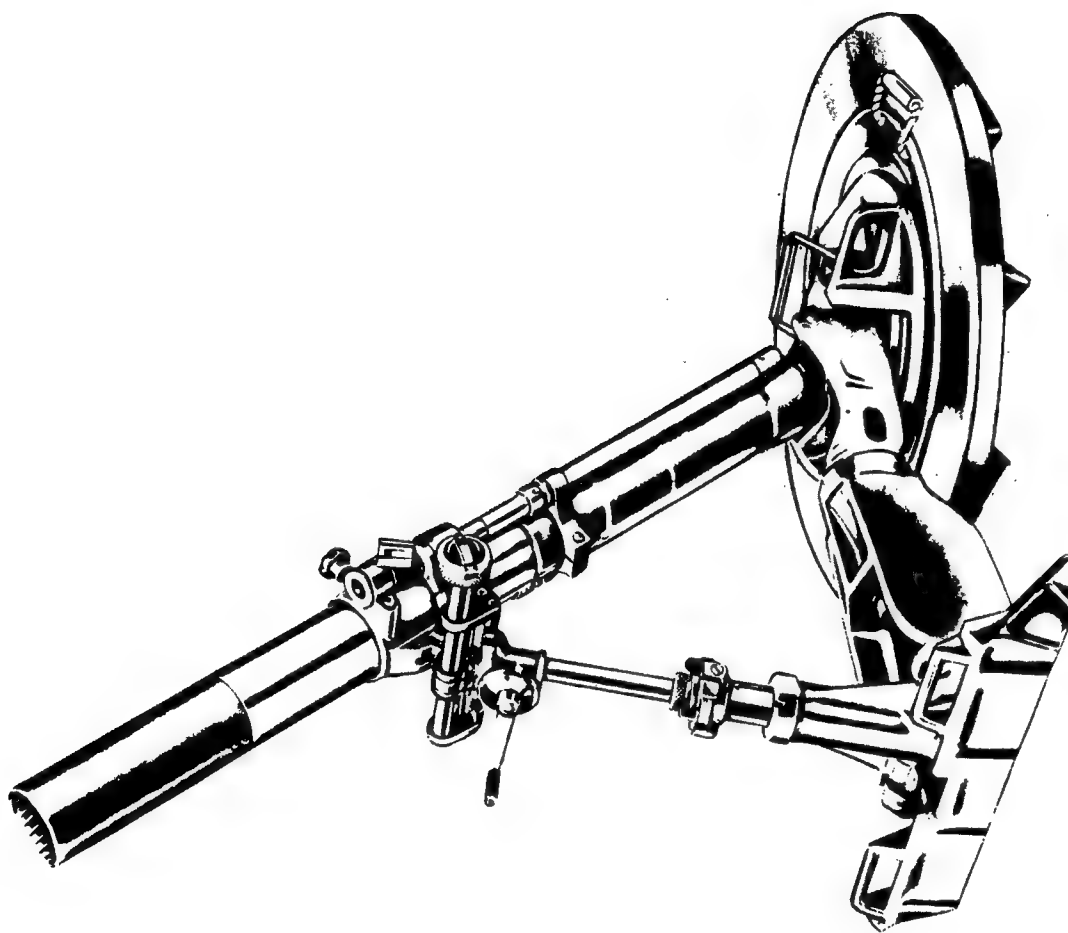
SOLUTION - INVESTIGATE MANUFACTURING PROCESSES FOR COMPONENTS (PLASTIC CASE, METAL BASE) ASSEMBLY, PRIMING, AND LOADING. MOLDING DIES AND OTHER TOOLING WILL BE DESIGNED, CONSTRUCTED, AND TESTED TO PROVE OUT SELECTED PROCESS.

(4537) TITLE - LOADING EQUIPMENT FOR .50 CALIBER BLANK AMMUNITION

300 700 800

PROBLEM - THE EXISTING EQUIPMENT IS OF WWII VINTAGE, LOW RATE, AND LABOR INTENSIVE. INCREASED REQUIREMENTS ARE BEYOND ITS PRESENT CAPACITY.

SOLUTION - EVALUATION WILL BE MADE OF PRESENT STATE-OF-THE-ART FOR THE SMALL CALIBER AMMUNITION FIELD AND EXPERIENCE FROM SCAMP AND MODIFY B LINES. A PROTOTYPE PRODUCTION SYSTEM WILL BE DESIGNED AND FABRICATED.



ARMAMENT R&D COMMAND
ARMAMENT MATERIEL READINESS COMMAND
(ARRADCOM, ARRCOM)
(WEAPONS)

<u>CATEGORY</u>	<u>PAGE</u>
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WEAPONS PROGRAM

The US Army Armament Materiel Readiness Command (ARRCOM), headquartered at Rock Island, IL, has responsibility for MMT projects on weapons in full scale production. ARRADCOM is responsible for MMT projects for weapons in development or initial production. Most of the weapons projects are performed through Watervliet Arsenal (WVA) and Rock Island Arsenal (RIA). The main emphasis of the weapons MMT program is the modernization and upgrading of operations through the REARM program. The purpose is to reduce costs and improve product quality by taking advantage of the advances in metal-working technology.

Many of the projects planned for FY81-85 at Watervliet Arsenal are related, in whole or in part, to the handling and fixturing of cannon tubes and their components. Since many items produced at Watervliet are large, complex and/or require close tolerances, the setup and movement time are important cost drivers.

A major cost driver at WVA is metal removal. Since the alloys used in weapons are expensive and difficult to work, producing components close to final shape will reduce the cost and time required for finishing. Methods being explored include hot isostatic pressing (HIP) and powder metallurgy (PM). Projects are also proposed to improve the metal removal process. High speed metal removal is addressed in several projects as are efforts proposed to perform multiple operations at one time. Some of the other areas in the Watervliet submission include group technology, computer-aided manufacturing, non-traditional surface hardening methods, chromium plating, and finding substitutes for critical materials.

Cost reductions and productivity increases in manufacturing continue to be the prime objectives of MMT at Rock Island Arsenal. Because RIA is a job-shop organization, administration and planning overhead is a significant cost driver. By developing an integrated computer-aided manufacturing/managment information system the Arsenal will be able to efficiently control all operations from receipt of an order to delivery of the product. Some of the management areas addressed include process modeling, performance measurement, computer-aided work measurement system, and online production information system. Cost benefits are also expected from improved material handling and in-process control projects which are tied into the overall CAM/MIS effort at RIA. Efforts in this area include robot loading of machines, and automated process control.

Since RIA's task is primarily metalworking, there are several projects included in this area. While all efforts will in themselves reduce costs, coupling with the Arsenal's overall CAM/MIS will further increase the benefits. Some of the areas covered include casting, welding, and electro-chemical grinding.

Minimizing energy consumption and pollution during manufacturing is a national priority and an important part of RIA's MMT submission. Areas being studied include heat recovery, and optimized heat treatment processes. As anti-pollution requirements become more stringent, it is necessary for manufacturers to improve their environmental posture while maintaining a competitive position or face close down by economic or legal factors. Rock Island Arsenal's MMT submission will correct present environmental difficulties and help prevent future ones so that the Arsenal's vital defense role will not be jeopardized.

Improved metalworking methods and increased use of computer-aided manufacturing are major production trends and the results of the projects in this submission are expected to hold significant interest for other producers, both Government and non-government. These projects will also be of importance in the modernization and upgrading of the facilities of weapons contractors, many of which are seriously outdated.

ARRCOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 -----	FY82 -----	FY83 -----	FY84 -----	FY85 -----
FIRE CONTROL	1200	1960	2223	3105	1492
GENERAL MANUFACTURING	2003	2363	4737	7220	4764
LARGE CALIBER	2716	4998	5042	6367	5750
POLLUTION ABATEMENT	0	0	0	0	130
QUALITY CONTROL/TESTING	80	190	1108	779	678
SMALL CALIBER	1083	1222	1721	1764	3025
TOTAL	7082	10733	14831	19235	15839

 * C A T E G O R Y *

 *FIRE CONTROL *

MNT FIVE YEAR PLAN
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- ASSEMBLIES

(8321) TITLE - EXPANDED APPLICATION OF ADHESIVE BONDING TO F.C. ASSEMBLY

450 470

PROBLEM - CURRENT ASSEMBLY METHODS DO NOT TAKE FULL ADVANTAGE OF THE MANY ADVANCED ADHESIVE SYSTEMS AVAILABLE. MANY OPERATIONS COULD BE CONVERTED WITH SIGNIFICANT SAVINGS IN BOTH TIME AND MONEY AND WITH INCREASED RELIABILITY.

SOLUTION - SELECT A SERIES OF ASSEMBLY OPERATIONS AS CANDIDATES FOR ADHESIVE BONDING, DESIGN BONDING SYSTEMS, APPLY, TEST AND EVALUATE. PREPARE PROCESS SPECIFICATIONS FOR THE SUCCESSFUL SYSTEMS.

COMPONENT -- GENERAL

(7966) TITLE - PRODUCTION ENGINEERING FOR TRITIUM RADIOLUMINOUS LAMPS

125 253

PROBLEM - CURRENT METHODS OF CONTROLLING MOISTURE CONTENT, SEALING AND ALUMINIZING TRITIUM LAMPS ARE BELIEVED RESPONSIBLE FOR THE PRESENT LACK OF DEPENDABILITY.

SOLUTION - DETERMINE THE PRODUCTION CONDITION THAT WILL RESULT IN OPTIMUM HALF-BRIGHT LIFE AND MODIFY CURRENT PRODUCTION METHODS ACCORDINGLY.

(8061) TITLE - NEAR MILLIMETER WAVE ANTENNA FABRICATION

125 122

PROBLEM - THERE IS A GROWING REQUIREMENT FOR RADAR SYSTEMS OPERATING AT WAVELENGTHS OF APPROXIMATELY 3 MILLIMETERS. A KEY COMPONENT IS THE ANTENNA. MANUFACTURING THESE TO REQUIRED TOLERANCES IS DIFFICULT AND COSTLY.

SOLUTION - REPLICATING TECHNIQUES SIMILAR TO THOSE USED IN OPTICAL MFG WILL BE EVALUATED. PROTOTYPE WILL BE FABRICATED AND TESTED. THE PROCESS WILL BE EVALUATED FOR PROD SUITABILITY.

(8263) TITLE - PROD - IN-PROCESS INSPECT EQUIP FOR LASER RANGE FINDER CHARAC

355

PROBLEM - CURRENT PRODUCTION/IN-PROCESS INSP. TECHNIQUES ARE REJECTING GOOD LASER RANGE FINDERS. THE REJECTION OF GOOD LRF IS ATTRIBUTED TO INACCURACIES OF RADIOMETERS AND INCANDESCENT LIGHT SOURCES USED TO MEASURE THE LASER POWER OUTPUT AND SENSITIVITY.

SOLUTION - ADVANCES IN ELECTRO-OPTICAL TECHNOLOGY, DIGITAL RADIOMETERS AND CALIBRATED SOLID STATE LIGHT SOURCES WILL BE USED TO CORRECT CURRENT INSP. INACCURACIES.

(8327) TITLE - COMPUTER AIDED ENGINEERING (CAE) TECHNIQUES F/FC

550 550 200

PROBLEM - MANUFACTURING METHODOLOGIES AND THE APPLICATION OF CAD AND CAM TO FC MANUFACTURING HAS ONLY PRODUCED ISOLATED IMPROVEMENTS AND MANY OF THE MAJOR PRODUCTION PROBLEMS STILL PREVAIL.

SOLUTION - A SYSTEMS APPROACH WITH COMPUTER INTEGRATED MANUFACTURING METHODOLOGIES TO ESTABLISH A CLOSE-LOOP SYSTEM FOR THE DESIGN-THROUGH MANUFACTURING PROCESS FOR FC, INCLUDING PLANNING ENGINEERING, QA, AND DECISION MAKING.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(CONTINUED)

(8363) TITLE - DISTRIBUTED NETWORK FOR FIRE CONTROL MANUFACTURING

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

COMPONENT -- OPTICS

(7807) TITLE - PROGRAMMED OPTICAL SURFACING EQUIP AND METHODOLOGY-CAM

PROBLEM - CURRENT TECHNIQUES FOR PITCH BUTTONGING AND BLOCKING PRECISION LENSES USE OLDER CONVENTIONAL EQUIP. ACCURACY DEPENDS ON THE SKILL AND EXPERIENCE OF WELL TRAINED MASTER OPTICIANS WHO ARE BECOMING SCARCE.

SOLUTION - ADOPT COMPUTER TECHNIQUES AND INSTRUMENTATION WITH CONTROLS TO PITCH BUTTONGING AND BLOCKING OPERATIONS. THE END PRODUCT WILL BE AN INTEGRATED SURFACING SYSTEM IMPLEMENTED IN THE FIRE CONTROL FABRICATION FACILITY AT ARRADCOM.

(8054) TITLE - IMPROVE MFG TECH AND QUAL OF OPTICAL SCRATCH AND DIG STAND

PROBLEM - PRESENT OPTICAL SCRATCH AND DIG STANDARDS ARE DIFFICULT AND EXPENSIVE TO MANUFACTURE, CALIBRATE, AND MAINTAIN

SOLUTION - ESTABLISH STANDARD MFG METHODS AND EQUIPMENT FOR EFFICIENTLY PRODUCING IMPROVED OPTICAL SCRATCH AND DIG STANDARDS. VALIDATE THE IMPROVED MFG TECHNIQUES.

(8080) TITLE - HIGH SPEED FABRICATION OF ASPHERIC OPTICAL SURFACES

PROBLEM - THE BULK OF THE COST OF OPTICS FOR FIRE CONTROL SYSTEMS LIES IN THE FIGURING AND POLISHING STAGE.

SOLUTION - USE THE TUBULAR TOOL GRINDING PROCESS TO PRODUCE ASPHERIC SURFACES DIRECTLY DURING THE GRINDING PROCESS

(8108) TITLE - THERMOGRAPHIC EVALUATION OF OPTIC BANDS

PROBLEM - THE BOND BETWEEN OPTICAL ELEMENTS AND THEIR STRUCTURAL SUPPORTS MUST BE FREE OF VOIDS, OF UNIFORM THICKNESS AND OF SUFFICIENT STRENGTH TO HOLD FAST AND MAINTAIN ALIGNMENT UNDER SEVERE SHOCK.

SOLUTION - INTRODUCE THERMOGRAPHIC PROCEDURES TO THE INSPECTION OF OPTICAL BONDS.

395 126

185 266

204 170

283

300 300 200

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- OPTICS

(CONTINUED)

(8165) TITLE - STANDARDS FOR DIAMOND TURNED OPTICAL PARTS

205 287

PROBLEM - EXISTING SURFACE FINISH STANDARDS AND TESTING EQUIPMENT AND TECHNIQUES DO NOT COVER THE RANGE OF DIAMOND TURNED OPTICAL SURFACES FOR A PRODUCTION ENVIRONMENT (1/2 TO 1 MICRINCH).

SOLUTION - CORRELATE LASER SCATTEROMETRY AND INTERFERENCE CONTRAST MICROSCOPY WITH FUNCTIONAL OPTICAL TESTING TO OPTIMIZE THE SPECIFICATION OF THE SURFACE WITH A MEASUREMENT TECHNIQUE FOR A PRODUCTION ENVIRONMENT.

(8209) TITLE - PILOT PRODUCTION OF GRADIENT INDEX OPTICS

213 274

PROBLEM - GRADIENT OPTICS, WHERE IN THE INDEX OF THE GLASS IS SEQUENTIALLY VARIED TO OBTAIN DESIGNED OPTICAL CHARACTERISTICS IS FAR MORE DESIRABLE THAN CURRENT USED, I.E., FORMING A CURVE ON THE GLASS SURFACE.

SOLUTION - ESTABLISH, SUBSEQUENT TO THE INTRODUCTION AND DEVELOPMENT OF GRADIENT OPTICS TO MILITARY USE, A PILOT PRODUCTION FACILITY TO MANUFACTURE GRADIENT OPTICS AT A REQUIRED RATE.

(8211) TITLE - NET SHAPE OPTICAL PROCESSING

400 500

PROBLEM - CONSIDERABLE TIME AND EFFORT IS REQUIRED TO PROCESS AN OPTIC FROM A RAW PRESSING TO ITS FINAL SHAPE.

SOLUTION - IMPROVE OPTICAL PRESSING TECHNIQUE TO ACHIEVE NEAR NET SHAPES IN THE INPUT BLANK.

(8261) TITLE - DEBONDING OF EPOXY RESIN ADHESIVE SYSTEM

132

PROBLEM - A RELIABLE AND EFFICIENT PROCEDURE FOR PRODUCTION AND DEPOT MAINTENANCE DEBONDING OF GLASS TO METAL MIL-A-48611 JUNCTIONS DOES NOT EXIST.

SOLUTION - CONVERT DEMONSTRATED LABORATORY DEBONDING TECHNIQUES TO PRODUCTION/DEPOT REPAIR PROCEDURE THAT WILL BE INCLUDED IN MIL-A-48611. THIS PROCEDURE WILL ALLOW FOR THE RECOVERY OF EXPENSIVE OPTICAL ELEMENTS AND THEIR REUSE.

(8262) TITLE - PRODUCTION METHODS FOR OPTICAL WAVE GUIDES

480 423

PROBLEM - MANUFACTURE OF INTEGRATED WAVEGUIDES IS COMPLICATED AND TIME CONSUMING INVOLVING PROCESSES RELATED TO METHODS USED TO MAKE SEMICONDUCTOR INTEGRATED CIRCUITS.

SOLUTION - USE ION IMPLANTATION TO ALTER OPTICAL PROPERTIES OF GALLIUM ARSENIDE AND PHOSPHIDE SUBSTRATES TO DIRECTLY FORM OPTICAL WAVEGUIDES IN A ONE-STEP PROCESS.

(8365) TITLE - RADIAL GRADIENT INDEX OPTICS

400 500

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- OPTICS

(CONTINUED)

(8467) TITLE - DIAMOND POINT TURNING OF GLASS OPTICS

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

* CATEGORY *

*GENERAL MANUFACTURING *

COMPONENT -- EQUIPMENT

(7417) TITLE - LASER WELDING TECHNOLOGY FOR WEAPON COMPONENTS

PROBLEM - CONVENTIONAL WELDING AND OTHER JOINING METHODS YIELD JOINTS WHICH ARE UNSUITABLE IN CERTAIN HIGH STRESS APPLICATIONS.

SOLUTION - LASER WELDING CAN PRODUCE ACCEPTABLE JOINTS.

(8154) TITLE - COMPUTER INTEGRATION MFG (CIM), DDNC

PROBLEM - NUMERICAL CONTROL MACHINE TOOLS OFFER MANY ADVANTAGES OVER CONVENTIONAL MACHINE TOOLS BUT HAVE CERTAIN DISADVANTAGES. ONE PROBLEM AREA IS GETTING MACHINE INSTRUCTIONS TO THE MACHINE TOOL AND COLLECTING MANAGEMENT INFORMATION.

SOLUTION - INTERFACE IN-HOUSE COMPUTER FACILITIES WITH CURRENT AND FUTURE NC MACHINE TOOLS TO FORM AN ADVANCED COMPUTER INTEGRATED MFG SYSTEM. UTILIZE DNC TECHNOLOGY.

(8227) TITLE - ROBOT LOADING OF NC MACHINES

PROBLEM - ALTHOUGH MODERN NUMERICALLY CONTROLLED MACHINES CAN MACHINE MANY PARTS WITH VIRTUALLY NO OPERATOR ATTENTION, OPERATORS ARE STILL REQUIRED TO LOAD AND UNLOAD THE MACHINES.

SOLUTION - DESIGN FIXTURES AND BANKS OF MACHINES THAT CAN BE LOADED AND UNLOADED BY A PROGRAMMABLE ROBOT FOR JOB SHOP OPERATION DESIGN THE SYSTEM SO ONE ROBOT CAN LOAD SEVERAL MACHINES WHICH ARE MACHINING DIFFERENT PARTS.

(8304) TITLE - APPLICATION OF NC WELDING (CAM)

PROBLEM - ALTHOUGH RIA IS A JOB SHOP, MANY MANUFACTURED ITEMS SUCH AS THE M140 GUN MOUNT, M45 RECOIL MECHANISMS, ETC., HAVE PRODUCTION LIFE SPANS OF MANY YEARS. FOR THOSE ITEMS, NC WELDING WILL PROVE MORE ECONOMICAL AND PROVIDE BETTER QUALITY.

SOLUTION - APPLY NC WELDING TO LONG RUN PRODUCTION PARTS. ON APPLICABLE ITEMS, NC WELDING WILL PROVIDE BETTER REPEATABILITY, EASIER FINAL MACHINING OF THE WELDMENT, REDUCED WELDING TIMES, AND REDUCE THE AMOUNT OF COSTLY WELDING CERTIFICATION REQUIRED.

COMPONENT -- EQUIPMENT

(CONTINUED)

(8424) TITLE - ROBOTIC CONTROL OF ARC WELDING

400 300

PROBLEM - THE REPAIR OF DEFECTIVE WELDS ARE FREQUENTLY EXPERIENCED. REPAIR REQUIREMENTS ARE OFTEN TRACED TO THE SKILL LEVEL OF THE WELDING OPERATORS.

SOLUTION - ADAPTIVE CONTROLS ARE BEING USED IN AN INCREASING NUMBER OF WELDING APPLICATIONS TO DEEMPHASIZE OPERATOR'S SKILL IN MAKING CONSISTENT PRODUCT. SUCH FEEDBACK CONTROL ROBOTS SHOULD BE USED ALSO IN WEAPONS FABRICATION.

(8501) TITLE - NON-ROTATION METHODS OF FRICTION WELDING

120

PROBLEM - ROTATIONAL FRICTION WELDING IS CONFINED TO APPLICATIONS IN WHICH AT LEAST ONE OF THE TWO PIECES TO BE JOINED HAS A CIRCULAR OR NEAR-CIRCULAR CROSS SECTION.

SOLUTION - NON-ROTATION FRICTION WELDERS SUCH AS ORBITAL AND OSCILLATORY TYPES ARE NOW AVAILABLE WHICH OVERCOME RESTRICTIONS ON SHAPE.

COMPONENT -- INFORMATION SYSTEMS

(8130) TITLE - LOWEST COST CHARGING SYSTEM FOR FOUNDRY (CAM)

124

PROBLEM - PRESENT METHODS OF DETERMINING THE CHARGE FOR PARTICULAR ALLOYS DO NOT ALLOW FOR THE MOST EFFICIENT USE OF RAW MATERIAL.

SOLUTION - DESIGN AND INSTALL A COMPUTERIZED LINEAR PROGRAMMING MODEL THAT WILL SELECT RAW MATERIALS, INCLUDING SCRAP, TO PROVIDE THE LOWEST COST CHARGE FOR THE DESIRED ALLOY.

(8132) TITLE - PERFORMANCE MEASUREMENT PARAMETERS FOR 6060 MFG.

174

PROBLEM - MEASURING THE PERFORMANCE OF A GOVERNMENT MANUFACTURING OPERATION IS DIFFICULT. GOGO OPERATIONS, ALTHOUGH PARTIALLY COMPETITIVE, ARE NOT IN A FULLY COMPETITIVE MARKETPLACE. ACCOUNTING DATA BY ITSELF IS NOT SUFFICIENT TO MEASURE PERFORMANCE.

SOLUTION - DEVELOP A SERIES OF MEASUREMENTS THAT COMBINE ACCOUNTING DATA AND PRODUCTION DATA TO ADEQUATELY ASSESS PERFORMANCE. INCLUDE DATA ON TECHNOLOGICAL IMPROVEMENTS, INFLATION, PRODUCT COST, ETC. MEASUREMENTS WILL BE USEFUL IN LONG RANGE PLANNING.

(8226) TITLE - COMPUTER AIDED WORK MEASUREMENT SYSTEM (CAM)

208

PROBLEM - TIME STUDIES AND USE OF STANDARD DATA PRESENTLY REQUIRE TIME CONSUMING MANUAL CALCULATIONS TO DEVELOP PRODUCTION STANDARDS.

SOLUTION - DEVELOP A COMPUTERIZED WORK MEASUREMENT SYSTEM THAT WILL VIRTUALLY ELIMINATE MANUAL CALCULATIONS IN THE DEVELOPMENT OF PRODUCTION STANDARDS. ROUTINES WILL INCLUDE PROGRAMS TO DEVELOP FINISHED STANDARDS FROM RAW TIME STUDIES OR STANDARD DATA.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- INFORMATION SYSTEMS

(CONTINUED)

(8305) TITLE - INTEGRATED MANUFACTURING SYSTEM (ICAM)

2575 3025

PROBLEM - MIS'S ARE APPLIED LOCALLY BUT THERE IS NO DATA MANAGEMENT SYSTEM FOR THE ENTIRE MANUFACTURING ACTIVITY. THIS INCREASES COST DUE TO LONG LEAD TIMES, SCHEDULE INTERRUPTIONS AND SHORTAGES OF MACHINE AVAILABILITY, LABOR AND MATERIALS.

SOLUTION - DEVELOP AN MIS WHICH ADDRESSES ACTIVITIES OF ALL DIRECTORATES SUPPORTIVE TO MANUFACTURING AT RIA. THE SYSTEM WILL USE STATE-OF-THE-ART TECHNOLOGY TO DELINEATE OPTIMUM SCHEDULING AND PIN POINT POTENTIAL PROBLEM AREAS FOR EASIER RESOLUTION.

(8306) TITLE - ON-LINE PRODUCTION INFORMATION SYSTEM (CAM)

360 300

PROBLEM - THE MANUFACTURING DATA BASE CANNOT BE ACCESSED THROUGH AN ON-LINE DATA BASE SYSTEM, MAKING INTEGRATION OF AUTOMATED SYSTEMS FOR PROCESS PLANNING, TIME STD'S GENERATION, FACILITIES/MOBILIZATION PLANNING AND PRODUCTION CONTROL SIMULATION DIFFICULT.

SOLUTION - DEVELOP THE MANUFACTURING DATA BASE FROM ITS PRESENT BATCH ORIENTATED ENVIRONMENT TO AN ON-LINE SYSTEM.

COMPONENT -- MISCELLANEOUS

(7945) TITLE - HEAT RECOVERY FROM MANUFACTURING PROCESSES

150

PROBLEM - LARGE AMOUNTS OF ENERGY ARE WASTED IN MANUFACTURING PROCESSES, E.G., HEAT TREATING, FORGING, SURFACE TREATMENT, AND CASTING.

SOLUTION - ANALYZE ENERGY CONSUMPTION RELATED TO THESE MANUFACTURING PROCESSES TO DETERMINE AREAS WHERE HEAT CAN BE ECONOMICALLY RECOVERED. DESIGN, INSTALL, AND PROVE OUT HEAT RECOVERY DEVICES WHERE ECONOMICAL.

(8030) TITLE - MANUFACTURING GUIDE FOR ELASTOMERIC SEALS

123

PROBLEM - CONSTANT PROBLEMS IN THE PROCUREMENT OF SATISFACTORY SEALS FOR WEAPONS SYSTEMS, I.E., M140, M127, ETC., ARE EXPERIENCED WITH RESULTANT SELF SOURCE PURCHASES.

SOLUTION - ELIMINATE SELF SOURCE PROCUREMENT BY DOCUMENTING PROCESSING TECHNIQUES AND FORMULA VARIATIONS FOR A VARIETY OF MILITARY SEALS FOR PUBLICATION IN A GUIDE FOR USE BY INDUSTRY.

(8160) TITLE - INITIAL PRODUCTION HANDBOOK

393 421 191 205

PROBLEM - A HIGH PERCENTAGE OF CRITICAL FIRE CONTROL EQUIPMENT FAILS FIRST ARTICLE TESTS. THE FAILURES ARE TRACEABLE TO THE USE OF INADEQUATE OR OUTDATED PRODUCTION AND TEST PROCEDURES.

SOLUTION - IDENTIFY AND ISOLATE FIRE CONTROL PRODUCTION PROBLEMS. INVESTIGATE AND TEST NEW TECHNIQUES TO ELIMINATE INADEQUATE MANUFACTURING PROCEDURES. DOCUMENT GENERIC PRODUCTION PROBLEMS RELATED TO FIRE CONTROL ITEMS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(8252) TITLE - INDUCTION HEATING OF VARYING DIAMETER PREFORMS

241

PROBLEM - INDUCTION HEATING OF RECYCLED GUN TUBES AND TAPERED PREFORMS
REQUIRES VARYING POWER INPUTS TO OBTAIN A UNIFORM TEMPERATURE. THE PRESENT
POWER CONTROL DOES NOT PROVIDE THE AUTOMATIC AND PRECISE CONTROL OF POWER
NEEDED.

SOLUTION - DESIGN A DEVICE THAT AUTOMATICALLY ADJUSTS POWER TO THE COILS BASED
ON THE PREFORM DIAMETER AT THE SECTION ENTERING THE COIL.

(8425) TITLE - IMPROVED REPAIR WELDING PRACTICES

200

PROBLEM - NO PROBLEM STATEMENT PROVIDED BY ARRADCOM

225

SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRADCOM

(8464) TITLE - PLASTIC COMPONENTS/INSTRUMENTS

300

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(8466) TITLE - INTEGRATED MILLIMETER WAVE COMPONENTS

250

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(8500) TITLE - NON-TOXIC COOLANT FOR HIGH SPEED MACHINING

150

PROBLEM - HIGH SPEED MACHINING CREATES HIGHER PRESSURES, TEMPERATURES, AND
VELOCITIES IN THE TOOL/WORKPIECE INTERFACE. PRESENT COOLANT MATERIALS ARE
NOT VOLATILE ENOUGH TO PROVIDE SUFFICIENT COOLING AND LUBRICITY.

SOLUTION - NEW COOLANTS ARE NEEDED WITH INCREASED VOLATILITY TO BOTH COOL AND
LUBRICATE THE WORKPIECE. CARE IN SELECTION IS NECESSARY TO AVOID THE USE OF
HIGHER VOLATILE MATERIALS THAT MAY BE TOXIC.

COMPONENT -- PROCESSES

(A614) TITLE - HOT WIRE TIG WELDING

150

PROBLEM - WELD QUALITY PROBLEMS LIMIT THE USE OF CONVENTIONAL HIGH PRODUCTION
SLAG-LESS WELDING (MIG) FOR WELDING OF ALLOY STEELS. ORDINARY TIG WELDING IS
HIGHER QUALITY BUT SLOW.

SOLUTION - EMPLOY HOT WIRE TIG WELDING FOR MAXIMUM SPEED AND QUALITY FUSION
WELDING OF ALLOY STEEL.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROCESSES

(CONTINUED)

(7707) TITLE - AUTOMATED PROCESS CONTROL FOR MACHINING (CAM)

105

135

PROBLEM - MACHINING OPERATIONS ARE SELECTED, PARAMETERS ARE SET, AND STANDARDS ARE ESTABLISHED EMPIRICALLY WITH LITTLE OR NO ENGINEERING ANALYSES, CONTROL OR FEEDBACK.

SOLUTION - APPLY COMPUTERIZED CONTROLS FOR OVERALL SELECTION OF PROCESSES, OPERATIONS, PARAMETERS, FEEDBACK AND OPTIMIZATION, WITH AUTOMATED ESTIMATING AND DETERMINATION OF REAL TIME AND COSTS.

(7940) TITLE - SYNERGISTIC PLATINGS WITH INFUSED LUBRICANTS

121

175

PROBLEM - LOW FRICTION, WEAR RESISTANT SURFACES ARE NEEDED FOR COMPONENTS IN SLIDING CONTACT.

SOLUTION - USE OF TWO-SYSTEM COATINGS INCORPORATING SOLID LUBRICANT INTERLOCKED WITH METAL PLATING.

(7948) TITLE - ESTABLISH CUTTING FLUID CONTROL SYSTEM

308

164

PROBLEM - THE LACK OF A CONTROLLED PROGRAM FOR THE USE OF CUTTING FLUIDS RESULTS IN HIGH MACHINING COSTS AND STOCKING OF MANY FLUIDS.

SOLUTION - ESTABLISH A PROGRAM TO CONTROL SHOP FLOOR TESTING AND DEFINE METHODS TO CONTROL USE OF CUTTING FLUIDS DURING MANUFACTURING OPERATIONS.

(8006) TITLE - ALLOY PLATING TO REDUCE CONSUMPTION OF CRITICAL MATERIAL

165

180

PROBLEM - SEVERAL COATING MATERIALS SUCH AS CHROMIUM ARE IN SHORT SUPPLY.

SOLUTION - REPLACE OR REDUCE THE AMOUNT OF CRITICAL ELEMENTS IN THE COATING BY ALLOY PLATING.

(8008) TITLE - "MANUAL" ADAPTIVE CONTROL (CAM)

141

PROBLEM - APPLICATION AND ADJUSTMENT OF MACHINING RATES AND OTHER PARAMETERS IS UNCERTAIN, SLOW AND COSTLY.

SOLUTION - APPLY MANUAL-COMPUTER PROGRAMS ON SHOP FLOOR TO OPTIMIZE AND CONTROL MACHINING OPERATIONS.

(8113) TITLE - ESTABLISHMENT OF ION PLATING PROCESS FOR ARMAMENT PARTS

150

142

PROBLEM - DOD IS REPLACING TOXIC CADMIUM WHEREVER POSSIBLE. CURRENTLY, CADMIUM PLATING IS SPECIFIED FOR APPROXIMATELY 3000 ARMAMENT COMPONENTS. EQUALLY IMPORTANT IS THE ELIMINATION OF THE HYDROGEN EMBRITTLEMENT OF STEEL CAUSED BY ALL ELECTROPLATING PROCESSES.

SOLUTION - ION PLATING ALUMINUM COATINGS TO STEEL ARMAMENT SUBSTRATES WILL PROVIDE CORROSION RESISTANCE SUPERIOR TO THAT OF ZINC OR CADMIUM PLATING. ION PLATING AND ELECTROPLATING COSTS ARE SIMILAR. PROCESS NEEDS TO BE ESTABLISHED FOR ARMAMENT ITEMS.

COMPONENT -- PROCESSES

(CONTINUED)

(8120) TITLE - ADAPTIVE CONTROL TECHNOLOGY (CAM)

225 260

PROBLEM - INEFFICIENT USE OF N/C MACHINE TOOLS DUE TO CONSERVATIVE PROGRAMMING IS UNECONOMICAL. ALSO THE INABILITY TO MONITOR A MULTIPLICITY OF TOOL FORMS CHARACTERISTIC OF N/C MACHINE CAPABILITY IS A LIMITER.

SOLUTION - EXTEND THE CURRENT ADAPTIVE CONTROL TECHNOLOGY TO CONTROL THE TOOL LOADS IN SMALL MILLS AND DRILLS SO THEY CAN BE PERFORMED IN THE SAME SETUPS. THIS WOULD MAXIMIZE THE USE OF BOTH NC EQUIPMENT AND TOOL SYSTEMS.

(8135) TITLE - SECOND ORDER MFG. METHODS FOR WEAPON COMPONENTS

613 566

PROBLEM - DURING MFG. OF RECOIL CONTROL ORIFICES, ERRORS ARE INTRODUCED WHICH REQUIRE REWORK. CORRECTIVE ACTIONS INVOLVE COSTLY DETAILED INSPECTION AND REANALYSIS WITH COMPUTERIZED DESIGN PROGRAMS TO DEFINE POSSIBLE REWORK ALTERNATIVES.

SOLUTION - AN IMPROVED MANUFACTURING METHOD UTILIZING ADAPTIVE CONTROLS AND AUTOMATED INSPECTION EQUIPMENT WILL BE ESTABLISHED. MACHINE TOOLS WILL BE RETROFITTED.

(8206) TITLE - APPLICATION OF HIGH-RATE ABRASIVE MACHINING

175

PROBLEM - CONVENTIONAL GRINDING IS SLOW AND COSTLY. LONG, MULTIPLE PASSES AND INFEEDS ARE REQUIRED TO SIZE AND FINISH WEAPON COMPONENTS.

SOLUTION - APPLY HIGH-SPEED ABRASIVE-BELT MACHINING.

(8225) TITLE - ELECTROCHEMICAL GRINDING OF WEAPON COMPONENTS

130

PROBLEM - SIZING AND FINISHING OF LARGE, LONG WEAPON COMPONENTS BY CONVENTIONAL GRINDING IS SLOW AND COSTLY, OFTEN REQUIRING MULTIPLE OPERATIONS, SET UPS, WHEEL CHANGES, AND REPETITIVE MULTIPLE PASSES. FOR EXAMPLE- PLANNING / GRINDING HOWITZER MOUNT RAIL.

SOLUTION - RETROFIT EXISTING, SPECIAL LONG BED, HORIZONTAL, SURFACE GRINDER WITH ELECTROLYTIC SYSTEM TO PROVIDE FAST, SINGLE PASS ROUGH FINISHING OF LARGE COMPONENTS, ELIMINATE ROUGHING BY PLANNING OR MILLING BEFORE ELECTROLYTIC GRINDING.

(8230) TITLE - NON SOLVENT BASED PAINTING PROCESSES

200

PROBLEM - CURRENTLY, SPRAY PAINT BOOTHS ARE USED FOR COATING METALS FOR HIDING POWER AND CORROSION RESISTANCE. THIS METHOD REQUIRES HYDROCARBON SOLVENTS AS A VEHICLE FOR THE PAINT. CONSEQUENTLY, THE SOLVENT IS DISCHARGED TO THE ATMOSPHERE.

SOLUTION - NEW SPECIFICATIONS MUST BE PREPARED TO SPECIFY THE USE OF NON SOLVENT BASED PAINT. METHODS SUCH AS ELECTROSTATIC PAINTING WILL BE ADAPTED TO ELIMINATE HYDROCARBON SOLVENTS. THIS WILL ALSO REDUCE WATER CONSUMPTION REQUIRED FOR ENTRAPMENT OF SOLVENTS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PROCESSES

(CONTINUED)

(8231) TITLE - IMPROVED CASTING TECHNOLOGY (CAM)

250 250

PROBLEM - EXCESSIVE METAL MUST BE MELTED IN CASTING OPERATIONS. THE YIELD RATIO OF SOME CASTS IS TOO LOW AND THE GATES AND RISERS TOO DIFFICULT TO CUT OFF. MATERIAL PROPERTIES OFTEN VARY WITH CASTING PROCEDURES.

SOLUTION - USING COMPUTERIZED TECHNIQUES AND PRODUCTION CASTING FACILITIES, THE OPTIMUM SHAKE OUT TIMES, RISER SLEEVES AND GATING AND RISERING CONFIGURATIONS WOULD BE DETERMINED. PROPERTIES OF CAST MATERIALS WILL BE EVALUATED FOR DIFFERENT CAST DESIGNS.

(8254) TITLE - AUTOMATED SURFACE COATING OF CANNON (CAM)

80 700

PROBLEM - IT REQUIRES APPROXIMATELY 2 1/2 HOURS PER TUBE TO APPLY ONE UNDER COAT AND TWO FINISH COATS OF PAINT BY MANUAL BRUSHING. CURRENT DRYING METHODS REQUIRE EXCESSIVE FLOOR SPACE AND OVERHEAD CRANE SUPPORT.

SOLUTION - DESIGN AN AUTOMATED SURFACE COATING SYSTEM THAT CONSISTS OF ELECTRONICALLY CONTROLLED, HYDRAULICALLY POWERED ELECTRO-STATIC SPRAYING MACHINES, INTEGRATED MATERIAL HANDLING, AND AUTOMATIC DRYING SYSTEMS, ALL UNDER COMPUTER CONTROL.

(8360) TITLE - ESTABLISHMENT OF ZINC ION VAPOR DEPOSITION PROCESS

215

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(8402) TITLE - WARM FORGING OF WEAPON COMPONENTS (CAM)

200 200

PROBLEM - EXCESSIVE ENERGY IS CONSUMED IN CONVENTIONAL FORGING. ALSO DIE LIFE IS SHORTENED BY HIGH FORGING TEMPERATURES AND BY OXIDATION.

SOLUTION - BY USING CAD/CAM TECHNIQUES FOR DIE DESIGN, FORGING WILL BE DONE AT MUCH LOWER TEMPERATURE AND THE FINAL PARTS WILL HAVE BETTER MECHANICAL PROPERTIES

(8403) TITLE - DESIGN CRITERIA FOR HARDENING (CAM)

150 200

PROBLEM - SELECTION OF THE BEST HARDENING PROCESS. INCOMPLETE HARDENING THROUGHOUT THE COMPONENT AND COMPLICATIONS CAUSED DURING THE HEAT TREATMENT OF WELDMENTS ARE RECURRING PROBLEMS CURRENTLY ADDRESSED BY EMPIRICAL METHODS.

SOLUTION - THE RELATIONSHIPS OF DIFFERENT VARIABLES SUCH AS QUENCH RATES, COMPONENT SIZE, SHAPE, AND COMPOSITION WILL BE ESTABLISHED. A COMPUTER WILL BE PROGRAMMED TO FURNISH THE NECESSARY INFORMATION

COMPONENT -- PROCESSES (CONTINUED)

(8406) TITLE - AUSTENITIZING AND HOMOGENIZING PROCEDURES FOR ARMOR CASTINGS 80

PROBLEM - ARMOR CASTINGS HAVE TO PASS IMPACT REQUIREMENTS WHICH DEPEND UPON THE HARDNESS. SOME OF THE HEATS FAILED TO MEET THESE STRINGENT REQUIREMENTS.
SOLUTION - DEPENDING UPON MNS DISTRIBUTION, HIGHER TEMPERATURE AUSTENITIZING TREATMENTS RESULTED IN THIS TEMPERATURE RANGE WILL BE EVALUATED AND THE EFFICACY OF NORMALIZING AND HOMOGENIZING TREATMENTS FOR THE CAST ARMOR WILL BE DETERMINED.

(8503) TITLE - ELECTRO-MECHANICAL JOINING TECHNIQUES 120

PROBLEM - PURELY MECHANICAL (FRICTION WELDING) OR MOSTLY ELECTRICAL (RESISTANCE) WELDING MACHINES OF VARIOUS TYPES WOULD HAVE TO BE LARGE AND WOULD TAKE EXCESSIVE TIME TO WELD JOINT AREAS 25 SQUARE INCHES OR MORE.
SOLUTION - COMBINE THE FEATURES OF BOTH METHODS TO DELIVER SUFFICIENTLY LARGE SPECIFIC ENERGY FOR WELDING OF LAGE PARTS.

(8504) TITLE - INTEGRATED DESIGN FOR CAST/WROUGHT COMPONENTS 200

PROBLEM - MANY WEAPON COMPONENT SPECIFICATIONS REQUIRE THE DESTRUCTIVE TESTING OF A SEPARATELY PREPARED COUPON RATHER THAN THE ACTUAL PART. FREQUENTLY THE MECHANICAL PROPERTIES OF THE MATERIAL IN THE COUPONS DIFFER FROM THOSE IN THE CASTINGS.
SOLUTION - THIS PROGRAM WILL ESTABLISH PROCEDURES FOR DESIGNING AND TREATING COUPONS THAT ACCURATELY REPRESENT THE ACTUAL PARTS.

(8522) TITLE - LASER SURFACE ALLOYING PROCESS FOR IMPROVED WEAR RESISTANCE 300

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.
SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(8523) TITLE - ION IMPLANTATION OF WEAPON COMPONENTS 375

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.
SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(8529) TITLE - ISOTHERMAL FORGING OF WEAPONS 150

PROBLEM - NO PROBLEM STATEMENT PROVIDED BY ARRADCOM
SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRADCOM

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TOOLING

(8248) TITLE - APPLICATION OF HIGH-RATE CUTTING TOOLS

102

PROBLEM - APPLICATION OF NEW HIGH-RATE CUTTING TOOLS LAG DUE TO LACK OF TESTING, ANALYSES AND ENGINEERED APPLICATIONS. MANUFACTURERS PROVIDE INSUFFICIENT DATA FOR EFFICIENT APPLICATIONS OF CERAMICS, OXIDES, NITRIDES, BORIDES, AND DIAMONDS.

SOLUTION - HIGH-RATE CUTTING TOOLS WILL BE TESTED, ANALYSED, AND APPLIED WITH BOTH NEW AND EXISTING MACHING TOOLS. ENGINEERING GUIDELINES WILL BE ESTABLISHED FOR BOTH PHYSICAL AND ECONOMIC MACHINING PARAMETERS AND LIMITS.

(8307) TITLE - CRYOGENIC TREATMENT OF TOOL STEELS

100

PROBLEM - MANY METAL CUTTING OPERATIONS REQUIRE TOOL STEEL CUTTERS OF FORMING TOOLS RATHER THAN CARBIDE OR CERAMIC MATERIALS. TOOL STEEL MATERIALS DO NOT HAVE AS LONG A USEFUL LIFE AS DO THE HARDER MATERIALS AND REQUIRE FREQUENT RESHARPENING.

SOLUTION - CRYOGENIC TREATMENT OF TOOL STEELS GREATLY IMPROVES THE WEAR CHARACTERISTICS OF THE TOOL AND GREATLY REDUCES THE FREQUENCY OF RESHARPENING.

(8400) TITLE - SPECIAL TOOLING FOR FLEXIBLE MANUFACTURING

100

125

PROBLEM - CONVENTIONAL, N/C, AND FLEXIBLE MANUFACTURING SYSTEMS USE SEPARATE TOOLING WHICH LACKS COMPLETE FLEXIBILITY FOR MULTIPLE-TOOL AND/OR MULTIPLE-SPINDLE CUTTING WITH INTERCHANGEABILITY.

SOLUTION - CLASSIFY TOOLING BY GROUPS, ESTABLISH INTERCHANGEABILITY, APPLY SPECIAL MULTIPLE TOOL AND/OR MULTIPLE-SPINDLE TOOLING IN FLEXIBLE MANUFACTURING OPERATIONS AND SYSTEMS.

* C A T E G O R Y *

*LARGE CALIBER *

COMPONENT -- BREECH MECHANISMS

(7730) TITLE - MANUFACTURE OF SPLIT RING BREECH SEALS

500

108

PROBLEM - SPLIT RINGS REQUIRE PRECISE MFG. PRESENT METHODS ARE OUTDATED AND COSTLY REQUIRING MUCH HAND FINISHING BY HIGHLY SKILLED WORKERS. REJECTION RATE HIGH WITH MUCH REMOK.

SOLUTION - AUTOMATED AND IMPROVED PROCEDURES WILL BE ADOPTED. NEW METHOD OF SLITTING RING REQUIRING LESS STOCK REMOVAL. SPECIAL EQUIPMENT WILL BE DESIGNED AND PURCHASED TO MINIMIZE HAND FINISHING BY HIGH SKILL OPERATORS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- BREECH MECHANISMS

(CONTINUED)

(7926) TITLE - HOT ISOSTATIC PRESSING (HIP) OF LARGE CANNON COMP 216 295

PROBLEM - MANY HOURS ARE REQUIRED TO MACHINE THE BREECH BLOCK FORGING TO THE FINISHED PART. MORE THAN 25% OF FORGING BECOMES CHIPS. WITH HIGH COST OF ALLOY STEEL, THIS BECOMES A VERY COSTLY WASTE OF MATERIAL.

SOLUTION - HOT ISOSTATIC PRESSING (HIP) WILL FORM BREECH BLOCKS TO NEARLY FINAL SHAPE, GREATLY REDUCING MACHINING COSTS.

(7927) TITLE - GENERATION OF BASE MACHINING SURFACES 86 137

PROBLEM - TO OBTAIN A DISTOR OF STOCK ON A ROUGH CAST COMPONENT, IT IS CURRENTLY NECESSARY TO "DRAW" THE FINISHED COMPONENT ON THE MATERIAL USING HT GAGE AND LAYOUT TEMPLATES. THIS IS DONE ON A TABLE FROM WHICH THE PART MOVES TO A MACHINE FOR SIMILAR SET-UP.

SOLUTION - USING PRESENT LAYOUT TECHNIQUES SUCH AS OPTICAL SHADOW LAYOUT TEMPLATES, THE COMPONENT CAN BE POSITIONED DIRECTLY ON THE MACHINE TO ESTABLISH THE FIRST CUT ELIMINATING THE INITIAL LAYOUT OPERATION.

(7928) TITLE - ROBOTIZED BENCHING OPERATIONS (CAM) 113 287

PROBLEM - BENCHING OPERATIONS ON BREECHBLOCKS AND RINGS ARE UNSAFE AND TIME CONSUMING.

SOLUTION - DEVELOP INDUSTRIAL ROBOT TO PERFORM THESE OPERATIONS.

(8062) TITLE - RAPID INTERNAL THREADING 69 366

PROBLEM - PRODUCING INTERNAL METRIC THREADS IN BREECH RINGS IS A SERIOUS PRODUCTION PROBLEM BECAUSE OF BOTH THE TECHNIQUES AND TOOLING REQUIRED. CONVENTIONAL THREAD HOBBIING PRESENTS A PRODUCTION BOTTLENECK.

SOLUTION - CURRENT TECHNOLOGY AND RECENT TOOLING BREAKTHROUGHS HAVE EXPANDED HIGH SPEED THREADING CONSIDERABLY. AUTOMATED THREADING WILL BE AN EFFICIENT, ECONOMIC REPLACEMENT FOR THE CURRENT MILLING-TYPE THREAD HOBBIING PROCESSES.

(8102) TITLE - APPLIC. OF POWDER METALLURGY FORGINGS TO COMP. 99 110 142

PROBLEM - FORGINGS AND CASTINGS ARE FABRICATED OVERSIZE AND SUBSEQUENTLY MACHINED DOWN TO FINAL DIMENSIONS. FINAL COMPONENT CONFIGURATION INVOLVES A LARGE AMOUNT OF MANPOWER AND MACHINES TO REMOVE ALLOY STEEL AS CHIPS.

SOLUTION - RECENT ADVANCES HAVE OCCURRED IN POWDER METALLURGY FORGING. THE ADVANCES WILL PRODUCE "NEAR NET SHAPE" COMPONENTS WHICH REDUCES AMOUNT OF MACHINING REQUIRED WHILE KEEPING ADEQUATE MECHANICAL PROPERTIES. UTILIZE NEW TECHNIQUE.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- BREECH MECHANISMS

(CONTINUED)

(8105) TITLE - ESTABLISH ROUGH THREAD BLANKS 8 IN. M201 BUSHING

88 292

PROBLEM - A SINGLE POINT TOOL IS NOW USED TO PRODUCE THE ROUGH FORMED BLANK FOR STEP THREADS ON STEP BLOCKS. CURRENT TIME VALUE IS 13.9 HOURS.

SOLUTION - POSSIBLE APPLICATIONS OF MULTIPLE SLOTTING TOOLS AND MILLING OFFER A FAR MORE EFFICIENT METAL REMOVAL PROCESS AIMED AT TIME/COST REDUCTION.

(8117) TITLE - SHAPED CASTING OF ESR MATERIAL

207

PROBLEM - COMPONENTS REQUIRE FORGING PLUS EXTENSIVE MACHINING TO ACHIEVE THE FINAL DIMENSIONS. THE FORGING PROCESS HAS ENCOUNTERED SOME PROBLEMS WITH THE MECHANICAL PROPERTIES RECURRING IN THE STEEL.

SOLUTION - A PRODUCTION PROCESS CAPABLE OF PRODUCING A SHAPED CASTING.

(8237) TITLE - MULTIPLE MACHINING OF CARRIER HOUSINGS

103 634 80

PROBLEM - THE 155MM M185 AND M199 CARRIER HOUSINGS REQUIRE NUMEROUS OPERATIONS FOR THE PRODUCTION OF COMPLEX INSIDE AND OUTSIDE DIAMETERS. STANDARD EQUIPMENT CANNOT PRODUCE THESE FEATURES EFFICIENTLY.

SOLUTION - A SPECIAL EQUIPMENT DESIGN WILL BE APPLIED TO ALLOW MACHINING AS MANY SURFACES AS POSSIBLE IN ONE SETUP.

(8238) TITLE - IMPROVED BORING TOOLS FOR BREECH RING LUGS

203

PROBLEM - PRESENT METHODS OF PRODUCING THE VARIOUS HOLES ON BREECH RINGS ARE TREPPANNING, TWIST DRILLING, GUN DRILLING, AND FINISH BORING. PRODUCTION OF THESE HOLES IS A TIME CONSUMING AND COSTLY OPERATION.

SOLUTION - THE JOINT PROCESS OF EJECTOR DRILLING AND INDEXABLE CARBIDE INSERT HOLE DRILLING PROMISES TO REDUCE THE SEQUENCE STEPS NOW REQUIRED AND TO PROVIDE A FAR MORE COST EFFECTIVE MEANS OF PRODUCING AN ACCEPTABLE HOLE.

(8339) TITLE - APPLIC OF NON-TRADITIONAL SURF. HARDENING METHODS

700 400

PROBLEM - PRESENT METHODS OF SURFACE HARDENING WEAPON COMPONENTS ARE COSTLY, TIME CONSUMING, AND MAY IMPART UNDESIRABLE RESIDUAL STRESSES.

SOLUTION - TO TRANSFORM THE SURFACE LAYER OF THE STEEL TO ALLOW MATERIAL TO BE UNIFORMLY QUENCHED. THE ADVANTAGES ARE LESS ENERGY USAGE, POLLUTION FREE, ALLOW HIGHER PRODUCTION RATES, AND MINIMAL POST-PROCESSING SUCH AS CLEANING AND STRAIGHTENING.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- BREECH MECHANISMS

(CONTINUED)

(8440) TITLE - CONTROLLED GRAIN SIZE CASTINGS, PRODUCTION AND HEAT TREAT

PROBLEM - FINE GRAIN CASTINGS HAVE DEMONSTRATED AN IMPROVEMENT IN LOW CYCLE FATIGUE LIFE BY A FACTOR OF TWO TO FOUR. IT IS EXPECTED THAT A HEAT TREATMENT WILL EXTEND THE LIFE STILL FURTHER.

SOLUTION - PROVIDE FOR CASTING A BREECH BLOCK BY ONE OF THE AVAILABLE TECHNIQUES THEN OPTIMIZE THE HEAT TREATMENT FOR THE CHOSEN ALLOY. LIFE IMPROVEMENTS WILL BE DEMONSTRATED.

300 800

COMPONENT -- GENERAL

(7724) TITLE - GROUP TECHNOLOGY OF WEAPON SYSTEMS

PROBLEM - THERE IS A NEED TO REDUCE AND CONTROL THE PROLIFERATION OF PARTS AND DESIGNS FOR ITEMS MANUFACTURED AT WATERVLIET ARSENAL.

SOLUTION - THE ARMY HAS PURCHASED A GROUP CLASSIFICATION AND CODING SOFTWARE PACKAGE. ONCE THIS SYSTEM IS IMPLEMENTED, IT SHOULD BE POSSIBLE TO REDUCE THE NUMBER OF DIFFERENT PARTS THRU STANDARDIZATION.

83 180 264

(8026) TITLE - APPLIC OF SYNTHETIC QUENCH TO GUN TUBES + COMP.

PROBLEM - QUENCHANTS ARE NOT SATISFACTORY FROM BOTH THE THERMAL AND SAFETY STANDPOINT.

SOLUTION - USE OF POLYMERIC MATERIALS TO ALTER QUENCH POWER OF BATH AND ALLOW HEAT TRANSFER TO OBTAIN RANGE OF COOLING RATES WHILE ELIMINATING HAZARDS ASSOCIATED WITH OIL QUENCHING.

380 250

(8249) TITLE - SHORT-CYCLE HEAT TREATING OF WEAPON COMPONENTS

PROBLEM - HEAT TREATING SOAK TIMES ARE DETERMINED WITHOUT CONSIDERATION OF THE RELATIONSHIPS BETWEEN COMPOSITION, CONFIGURATION, THICKNESS, AND DETRIMENTAL EFFECTS OF AUSTENITIC GRAIN GROWTH. CONSEQUENTLY, CONSIDERABLE ENERGY IS WASTED.

102 125

SOLUTION - SUITABLE SYSTEMATIC PRODUCTION METHODS WILL BE USED TO DETERMINE THE PROPERTIES OBTAINED AT MINIMAL PROCESSING TIMES TO REDUCE ENERGY CONSUMPTION AND INCREASE PRODUCTION EFFICIENCY.

(8323) TITLE - SPRAY-AND-FUSE PROCESSING OF ARMAMENT COMPONENTS

PROBLEM - MISMATCHED AND WORN WEAPON COMPONENTS ARE NOT ONLY COSTLY TO REPLACE BUT SHORTAGE OF STRATEGIC MATERIALS IMPACT ON THE SUPPLY AND FABRICATION OF NEW COMPONENTS.

205 185

SOLUTION - UTILIZE THE THERMAL SPRAY AND FUSE COATING PROCESS TO SALVAGE OR RECLAIM OVERSIZED OR WORN WEAPON COMPONENTS (E.G., M140 RECOIL PISTONS).

COMPONENT -- GENERAL (CONTINUED)

(8326) TITLE - APPLICATION OF CORROSION RESISTANT GALVANIC COATINGS

175 210

PROBLEM - CURRENT METAL FINISHES DO NOT PROVIDE ADEQUATE CORROSION AND HEAT RESISTANCE. COMPONENTS ARE REPLACED OR REWORKED BEFORE THEIR INTENDED LIFE. FREQUENT MAINTENANCE IN THE FIELD AND DEPOTS ADD TO THE OVERALL COST OF THE COMPONENTS.

SOLUTION - A NEW PROCESS HAS EMERGED FOR APPLYING SUPERIOR CORROSION AND HEAT RESISTANT COATINGS. THE PROCESS, USING SERML-16, CONSISTS OF AN AUTOMATED SPRAY-BAKE PROCESS FOR A COATING OF ALUMINUM/CERAMIC AND INORGANIC COATINGS.

(8345) TITLE - IMPROVED TOOLING PERFORMANCE, PREDICTIVE MODEL (CAM)

120

PROBLEM - INABILITY TO PREDICT TOOL PERFORMANCE LIMITS TOOL WEAR LIFE AND OFTEN RESULTS IN PREMATURE FAILURE OF THE INSERT, THUS LIMITING PRODUCTIVITY AND INCREASING MACHINE DOWN TIME.

SOLUTION - ESTABLISH A METHOD FOR EVALUATING QUALITY/CAPABILITY OF TOOLING INSERTS TO OPTIMIZE WEAR LIFE BY VARYING MACHINING PARAMETERS (FEEDS, SPEEDS, DEPTH OF CUT) AND PROVIDE FOR STATISTICAL PREDICTION ABOUT FAILURE INTERVALS.

(8353) TITLE - IMPROVED PRODUCTION OF MUZZLE BRAKE CASTINGS

300

PROBLEM - ONLY ONE COMMERCIAL SOURCE OF MUZZLE BRAKE CASTINGS FOR THE 155MM M165 EXISTS. NON-COMPETITION RESULTS IN A HIGHER COST PER MUZZLE BRAKE CASTING. THE SOLE SOURCE SITUATION LIMITS MOBILIZATION RESPONSE.

SOLUTION - INITIATE "BEST EFFORT" CONTRACTS TO SEVERAL FOUNDRIES TO ESTABLISH CAPABILITY TO MEET TDP REQUIREMENTS AND OPEN THE PROCUREMENT PROCESS TO ADDITIONAL QUALIFIED SOURCES.

(8527) TITLE - FORMING OF MULTI-LAYERED ARMAMENT COMPONENTS

410

PROBLEM - NO PROBLEM STATEMENT PROVIDED BY ARRADCOM

SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRADCOM

COMPONENT -- GUN MOUNTS

(8035) TITLE - COATING TUBE SUPPORT SLEEVES WITH BEARING MATERIALS

180 200

PROBLEM - METALLIZED COATINGS ON SUPPORT SLEEVES FOR GUN MOUNTS ARE BRITTLE AND LACK BOND STRENGTH.

SOLUTION - USE INDUCTION/ARC-INERT GAS METHODS TO COAT SLEEVES WITH BEARING MATERIALS.

COMPONENT -- GUM MOUNTS

(CONTINUED)

(8251) TITLE - IMPROVED MELTING AND POURING TECHNOLOGY

PROBLEM - THERE IS A HIGH REJECTION RATE FOR CASTING POURED AT RIA BECAUSE MODERN TECHNIQUES ARE NOT USED TO MEASURE AND CONTROL PROCESS PARAMETERS AND POROSITY.

SOLUTION - PROCEDURES TO MINIMIZE DISSOLVED GAS AND TO MORE ACCURATELY MEASURE GAS CONCENTRATIONS WILL BE ESTABLISHED. METHODS OF MEASURING TEMPERATURES AND COMPOSITIONS OF ATMOSPHERES IN FURNACES AT RIA WILL BE ESTABLISHED.

193 164

COMPONENT -- RECOIL MECHANISMS

(8228) TITLE - BALL SIZING OF RECOIL CYLINDERS

PROBLEM - INTERNAL HONING IS REQUIRED TO ACHIEVE THE SURFACE FINISHES AND TOLERANCES REQUIRED FOR RECOIL CYLINDERS. HONING IS EXTREMELY TIME CONSUMING AND ALSO NOISY.

SOLUTION - REPLACE INTERNAL HONING WITH BALL SIZING ON RECOIL SIZING MECHANISMS. BY FORCING A BALL (WITH A DIAMETER SLIGHTLY LARGER THAN THAT OF THE CYLINDER) THROUGH THE CYLINDER, THE SURFACE FINISH AND TOLERANCE CRITERIA CAN BE ACHIEVED.

267

(8239) TITLE - IMPROVED MACHINING PROCEDURES FOR RAILS

PROBLEM - CURRENTLY THE DOVETAIL CONFIGURATION ON THE RAILS IS MILLED WITH A SERIES OF HIGH SPEED STEEL FORM MILLS. THESE MILLS REQUIRE A GREAT DEAL OF SHARPENING, AND THIS CHANGES THEIR SIZE THIS COMPOUNDING THE PROBLEM OF MAINTAINING ALIGNMENT.

SOLUTION - A 60 PERCENT REDUCTION IN MANUFACTURING TIME COULD BE REALIZED USING THE LATEST CONCEPTS IN MACHINE TOOLS. THESE INCLUDE CROSS AXIAL MOVEMENTS AND A METHOD OF HIGH SPEED MILLING USING INDEXABLE CARBIDE INSERTS.

254

(8250) TITLE - IMPROVED FABRICATION OF RECOIL WEAR SURFACES

PROBLEM - PRESENTLY GRINDING AND HONING OPERATIONS ON WEAK SURFACES RESULT IN PARTICLE INCLUSIONS WHICH COME IN CONTACT WITH HYDRAULIC AND PRODUCE HIGH WEAR RATES.

SOLUTION - USING ADVANCED METHODS REMOVE FOREIGN PARTICLES PRIOR TO THE FINAL GRINDING OR HONING OPERATIONS OR, IF MORE EFFECTIVE, AFTER FINAL GRINDING OR HONING.

102 125

(8405) TITLE - FOUNDRY MOLDING WITH POLYSTYRENE PATTERNS

PROBLEM - COMPLEX CASTING SHAPES REQUIRE A LARGE NUMBER OF CORES WHICH ARE EXPENSIVE TO MAKE, SET, AND ANCHOR IN PLACE. ALSO, WOOD PATTERN COSTS ARE HIGH FOR THESE CASTINGS.

SOLUTION - THE USE OF LOW DENSITY EXPENDABLE POLYSTYRENE PATTERNS REQUIRE NO CORES, EVEN FOR COMPLEX SHAPES AND ELIMINATE THE NEED FOR WOODEN PATTERNS AND CORE BOXES.

267

FUNDING (\$000)

PRIOR 81 82 83 84 85

(CONTINUED)

COMPONENT -- RECOIL MECHANISMS

(8422) TITLE - HONE FORMING OF RECOIL CYLINDERS

PROBLEM - REPLACEMENT OF SCARRED, WORN OR MISMACHINED RECOIL CYLINDERS ARE COSTLY AND TIME-CONSUMING IN TERMS OF LONG-LEAD TIMES FOR MATERIAL DELIVERY AND MACHINING. CYLINDER REPLACEMENT REQUIRES ADDITIONAL CONSUMPTION OF STRATEGIC MATERIALS.

SOLUTION - HONE FORMING IS A SIMULTANEOUS PROCESS WHERE HONING AND MATERIAL BUILDOUT BY ELECTROPLATING TAKE PLACE TO ACHIEVE THE DESIRED DIMENSION AND FINISH. COST SAVINGS CAN BE ACHIEVED WITH THE PROCESS FOR RECOIL CYLINDER MANUFACTURE AND RECLAMATION.

450 700

COMPONENT -- TUBES

(7309) TITLE - REPLACEABLE STEEL LINERS FOR CANNON TUBES

PROBLEM - TUBE LIFE IN SEVERAL HIGH PERFORMANCE CANNONS SUCH AS THE 155MM HOW M199 AND OTHERS IS LIMITED BY EROSION AND LOSS OF ACCURACY IN A RELATIVELY FEW ROUNDS AT MAXIMUM CHARGE.

SOLUTION - DEVELOP HFG. PROCESS FOR FABRICATION OF THIN LINERS AND PROCESS FOR PLACING THESE LINERS IN CANNON TUBES, THEREBY EXTENDING CANNON LIFE.

900

(7916) TITLE - APPLICATION OF LOW COST MANDREL MATERIALS

PROBLEM - TO PRODUCE A SATISFACTORY SUBSTITUTE FOR TUNGSTEN CARBIDE MANDREL TO ELIMINATE SOLE SOURCE PROCUREMENT. THE PRICE OF THE MANDRELS HAS INCREASED FIFTY PERCENT OVER THE LAST 5 YEARS.

SOLUTION - HIGH SPEED STEEL MANDRELS HAVE BEEN USED FOR SWAGE PROCESS IN UNITED KINGDOM. THIS SHOULD BE A SUBSTITUTE FOR TUNGSTEN CARBIDE MANDRELS.

168

(7925) TITLE - BORE EVACUATOR BORING

PROBLEM - BOTH ENDS OF THE BORE EVACUATOR HAVE SIMILAR DIAMETER BORES AND REQUIRE ALMOST EQUAL MACHINING WITH HIGH COST OF MACHINING TIME. REDUCTION OF MACHINING TIME IS IMPERATIVE. ORIENTATION OF THE BORES IS IN RELATION TO EACH OTHER.

111 248

SOLUTION - A SPECIAL PURPOSE MACHINE AND TOOLING PKG PROVIDING A HEAD FOR EACH END OF THE EVAC CHAMBER CAN BE DEVELOPED TO PRODUCE BOTH BORES SIMULTANEOUSLY. IF BOTH SURFACES WERE PRODUCED FROM THE SAME SET UP, ORIENTATION OF CENTERLINES WOULD BE ASSURED.

(7990) TITLE - IMPROVED FABRICATION AND REPAIR OF ANODES

PROBLEM - THE PURCHASE OF NEW OR THE REPAIR OF ANODES IS EXPENSIVE AND TIME-CONSUMING. CURRENTLY USED MELTED ON LEAD CLADDING IS INFERIOR TO ELECTRODEPOSITED LEAD BECAUSE OF VARIATIONS OF THICKNESS AND OXIDE INCLUSIONS.

150 100

SOLUTION - AN ELECTRODEPOSITION SYSTEM CAPABLE OF DEPOSITING LEAD WILL ENABLE FABRICATION AND REPAIR OF ANODES IN CONSIDERABLY LESS TIME THAN NOW REQUIRED AND AT A LOWER COST.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TUBES

(CONTINUED)

(8024) TITLE - HIGH SPEED ABRASIVE BELT GRINDING

324 142

PROBLEM - SLIDE SURFACE DIAMETER AND FINISH IS PRESENTLY PRODUCED ON CYLINDRICAL GRINDING MACHINES USING ABRASIVE WHEELS. THE TIME IT TAKES FOR THIS OPERATION CAN BE SIGNIFICANTLY REDUCED.

SOLUTION - ABRASIVE BELT GRINDING DEPENDING ON ITS APPLICATION HAS METAL REMOVAL RATES WHICH CAN EXCEED MILLING OR GRINDING AT THE SAME TIME PRODUCING EXCELLENT TOLERANCES AND SURFACE FINISH.

(8050) TITLE - RECYCLING SPENT GUN TUBES BY ESR MELTING

204

PROBLEM - BECAUSE OF ANTICIPATED SHORTAGES IN THE AVAILABILITY OF CRITICAL ALLOYS, IT IS ADVANTAGEOUS TO UTILIZE SPENT GUN TUBES.

SOLUTION - TUBES WHICH CANNOT BE DIRECTLY ROTARY FORGED MIGHT BE REMELTED DIRECTLY BY ESR INTO INGOTS FOR USE ON THE ROTARY FORGE.

(8103) TITLE - HIGH VELOCITY MACHINING

37 414 85

PROBLEM - SPEED OF MACHINING CANNON TUBES IS LIMITED WITH CURRENT EQUIPMENT.

SOLUTION - EVALUATE HIGH SPEED METAL REMOVAL METHODS AND AVAILABLE EQUIPMENT. FUTURE YEARS FUNDING WILL PROVIDE FOR ACQUISITION AND TESTING OF NEW MACHINE AND PROCESS.

(8106) TITLE - LARGE CALIBER POWDER CHAMBER BORING

59 159 72

PROBLEM - POWDER CHAMBERS PRODUCTION ON LARGE BORE CANNON, 8 IN M201, CURRENTLY REQUIRES 14 HOURS TO ACCOMPLISH BOTH ROUGH AND FINISH OPERATIONS.

SOLUTION - PERFORM THE FINISHING OPERATION IN THE SAME SETUP AS THE ROUGHING OPERATION BUT USING AS A CUTTING MEDIA DIAMOND FINISHING TOOLS WHICH AT VERY HIGH SPEEDS PRODUCE EXCELLENT SURFACE FINISH. THIS PROCESS WOULD ELIMINATE ONE GRINDING OPERATION.

(8107) TITLE - CREEP FEED CRUSH FORM GRINDING

661 73

PROBLEM - THE BRACKET SLOT ON THE 105MM M68 BREECH RING IS A HIGH COST OPERATION. IT IS CURRENTLY MILLED WITH FORM TOOLS IN TWO OPERATIONS-ROUGH AND FINISH.

SOLUTION - A NEW PROCESS IS BEING DEVELOPED THAT RESEMBLES THE CRUSH FORM ABRASIVE MACHINE FOR CYLINDRICAL PARTS EXCEPT THAT THE PROCESS IS USED TO PRODUCE FLAT CONTOURED SURFACES. IT IS PROPOSED THIS PROCESS BE ADAPTED TO PRODUCTION OF THE BRACKET SLOT.

COMPONENT -- TUBES

(CONTINUED)

(8151) TITLE - PORTABLE ENGRAVING SYSTEM

84 171

PROBLEM - CURRENTLY THE COMPONENT IDENTIFICATION LEGEND IS STAMPED BY HAMMER AND INDIVIDUAL ALPHA-NUMERIC STAMPS. THIS IS A TIME CONSUMING PROCESS WITH NO DEPTH CONTROL AND CAN PRESENT A SAFETY HAZARD TO PERSONNEL.

SOLUTION - PROVIDE A PROGRAMMABLE DATA ENGRAVING SYSTEM TO RELIEVE THE OPERATOR OF THE FATIGUE AND HAZARD OF HAND STAMPING. THIS WILL RESULT IN MORE UNIFORM SPACING AND DEPTH CONTROL AND REDUCE BOTH TIME AND COST.

(8152) TITLE - IMPROVED ANODE STRAIGHTNESS FOR CHROMIUM PLATING

280

PROBLEM - ANODE STRAIGHTNESS AND RIGIDITY ARE IMPORTANT FOR MAXIMUM AND UNIFORM RADIAL DISTRIBUTION OF CURRENT. A SOLID COPPER ROD IS PRESENTLY USED. ALTHOUGH ANODES ARE MADE AND PRESERVED AS CAREFULLY AS POSSIBLE STRAIGHTNESS IS A RECURRING PROBLEM.

SOLUTION - THIS PROJECT WILL USE IN THE COPPER ANODES A COMMERCIALY AVAILABLE COMPOSITE ROD MADE OF UNIDIRECTIONAL GRAPHITIC FILAMENTS IN A SUITABLE MATRIX. THE SPECIFIC STRENGTH WILL BE 33 TIMES HIGHER AND THE SPECIFIC MODULUS 9 TIMES HIGHER THAN COPPER.

(8153) TITLE - INCREASING GUN TUBE HEAT TREATMENT CAPACITY

325

PROBLEM - OIL-FIRED SELAS CONTINUOUS HEAT TREATING CANNOT MEET THE PRODUCTION CAPACITY OF THE ROTARY FORGE. THE OUTPUT OF THE HEAT TREAT LINE MUST BE INCREASED THREE-FOLD TO MEET MOBILIZATION REQUIREMENTS.

SOLUTION - INCREASE CAPACITY BY MODIFYING PRESENT SYSTEM, ADDING SECOND MODIFIED SYSTEM, ADDING A STABILIZING FURNACE, AND SHORTENING AUSTENITIZATION CYCLE. ANOTHER POSSIBILITY IS TO USE RAPID HEATING RATES AVAILABLE WITH INDUCTION HEATING TO REDUCE TIME NEED.

(8241) TITLE - COMPUTER APPLICATIONS TO BORE GUIDANCE

308

PROBLEM - THE BORE GUIDANCE SYSTEM CONSISTS OF MANY INTERDEPENDENT ELEMENTS MAKING IT DIFFICULT AND TIME CONSUMING TO DIAGNOSE PROBLEMS. ALSO, TUBES WITH LARGE WALL VARIATIONS GREATLY INCREASE THE DIFFICULTY IN MAINTAINING CONTROL.

SOLUTION - COMPUTER CONTROL WILL MAKE POSSIBLE SUCH FEATURES AS SELF TESTING, CHECKING, MONITORING, AND CALIBRATION IN CONTROL, TEST, AND MEASUREMENT SYSTEMS.

(8242) TITLE - DUAL PRESS LOADING

120

PROBLEM - ABOUT 20 PCT OF GUN TUBE FORGINGS REQUIRE STRAIGHTENING AT TEMPERATURES ABOVE 600 DEG F BECAUSE THE CRITERIA FOR "COLD" STRAIGHTENING ARE RELATIVELY TIGHT. SINGLE LOADING INDUCES STRESSES THAT CREATE MACHINING PROBLEMS.

SOLUTION - A TWO POINT LOADING DEVICE WILL BE DESIGNED WHICH WILL APPLY LOADS AT TWO POINTS THUS REDUCING INDUCED STRESSES

COMPONENT -- TUBES

(CONTINUED)

(8243) TITLE - COMPUTER CONTROLLED CHROMIUM PLATING PROCESS

301 260

PROBLEM - CHROMIUM PLATING OF CANNON BARRELS IS A COMPLICATED, MULTI-STAGE PROCESS WHICH IS MANUALLY CONTROLLED. MANUAL MANIPULATION OF VALVE STRESS, SWITCHES, ETC., IS SLOW, SOMETIMES HAZARDOUS, AND CAN RESULT IN DEGRADED DEPOSIT QUALITY DUE TO HUMAN ERROR.

SOLUTION - THE CRITICAL STAGES OF THE CHROMIUM PLATING PROCESS WILL BE IDENTIFIED AND A PROGRAMMABLE CONTROLLER(S) DEVELOPED TO REDUCE TO NEAR ZERO THE MANIPULATION FUNCTIONS REQUIRED OF AN OPERATOR.

(8244) TITLE - OPTIMIZATION OF HEAT TREAT

290

PROBLEM - ROTARY FORGED TUBES ARE CURRENTLY HEAT TREATED BASED ON HISTORICAL DATA. IF THE INITIAL CYCLE DOES NOT RESULT IN ADEQUATE PROPERTIES ADDITIONAL CYCLES ARE PERFORMED UNTIL ACCEPTABLE PROPERTIES ARE ATTAINED.

SOLUTION - INFORMATION ON EACH PREFORM TOGETHER WITH HISTORICAL DATA WILL BE USED TO DEVELOP A COMPUTER PROGRAM TO GENERATE HEAT TREAT PARAMETERS. THIS WILL GREATLY INCREASE THE PROBABILITY THAT THE REQUIRED PROPERTIES WILL BE OBTAINED ON THE FIRST CYCLE.

(8245) TITLE - LOW CONCENTRATION (LC) CHROMIUM PLATING

241 195

PROBLEM - HIGH CONCENTRATION CHROMIUM COATING IS CURRENTLY USED TO RESIST EROSION IN GUN BORES. INHERENT PROPERTIES MAKE THE COATING SUSCEPTIBLE TO SHEARING AND FLAKING.

SOLUTION - PLATING WITH LOW CONCENTRATION CHROMIUM WILL GIVE A MARKED INCREASE IN WEAR RESISTANCE DUE TO ITS SUPERIOR CHARACTERISTICS.

(8246) TITLE - IMPROVED FINISHING OF GAS CHECK SEATS

153

PROBLEM - MACHINING OF GAS CHECK SEATS IS A PRECISION PROCESS INVOLVING GRINDING AND LAPPING OF A CRITICAL AREA OF THE CANNON WHICH RESULTS IN 30 TO 50 PERCENT REWORK TO PASS CONTACT GAGE REQUIREMENTS.

SOLUTION - APPLY MORE PRECISE ALIGNMENT OF FINISHING EQUIPMENT AND ELIMINATE THE MACHINING FACILITY WHICH TENDS TO INDUCE ECCENTRICITY. THE GAUGING SYSTEM WILL ALSO BE REVIEWED.

(8259) TITLE - MACH/MARKING OF FIRE CONTROL REGISTERS

261

PROBLEM - DIFFICULTY IN MEASURING AND CORRECTLY MARKING THE FIRE CONTROL REGISTER, ON VARIOUS MID CALIBER WEAPON SYSTEMS, INDICATING COMPENSATION FOR MANUFACTURING VARIANCE DUE TO TOLERANCE ALLOWANCES.

SOLUTION - PROVIDE AN ANALOG LEVELING MEASURING SYSTEM WHICH WILL PROVIDE INPUT DATA FOR A SERVOCONTROLLED JACKING SYSTEM TO POSITION LEVEL A TUBE AT THE MUZZLE END AND A MEASURING SYSTEM FOR THE VARIATIONS AT THE BREECH LEVELING SITE.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TUBES

(CONTINUED)

(8341) TITLE - HOLLOW CYLINDER CUT OFF MACHINE

84 655

PROBLEM - ESTAB. CYL LENGTH IS DONE 1 OF 2 WAYS. PARTED OFF IN A LATHE AND FACED TO LENGTH OR SAWED OFF AND THEN SET UP IN A LATHE FOR FACING TO FINAL LENGTH DIMENSIONS. IN EITHER CASE, THE OPERATION REQUIRES DOUBLE HANDLING OR SLOW OPERATING PROCEDURES.

SOLUTION - NEW TECHNOLOGY IS BEING DEVELOPED WHEREBY A SET OF ROTATING CUTTERS MILLS THE CYLINDER TO LENGTH PRODUCING A FACE SURFACE TO SATISFY OUR TUBE LENGTH REQUIREMENTS CURRENT MACH. DESIGN WILL NOT PERFORM THIS FUNCTION BUT THE TECHNOLOGY IS APPLICABLE.

(8343) TITLE - LASER CUTTING OF CANNON TUBES

950 850

PROBLEM - AN INORDINATE AMOUNT OF TIME IS REQUIRED TO PERFORM CUTTING AND REMOVAL OF EXCESSIVE MATERIAL FROM GUN TUBES.

SOLUTION - A LASER MACHINING PROCESS WITH SUFFICIENT OUTPUT ENERGY TO ACCOMMODATE LARGE WALL THICKNESSES WILL BE DEVELOPED.

(8344) TITLE - PARTIAL REFRACTORY LINERS FOR CANNON TUBES

250 300

PROBLEM - MANUFACTURING PROBLEMS ARE ASSOCIATED WITH THE FABRICATION, MACHINING, AND ASSEMBLY OF THIN REFRACTORY LINERS INTO CANNON TUBES.

SOLUTION - DEVELOP NEW TECHNIQUES AND MANUFACTURING PROCESSES TO SOLVE THESE PROBLEMS.

(8346) TITLE - DEBURRING OF BORE EVACUATOR HOLES

237 250

PROBLEM - AN INABILITY TO SUCCESSFULLY AND CONSISTENTLY PRODUCE A SMOOTH RADIUS TO THE INTERNAL OPENING OF THE BORE EVACUATOR HOLES OF THE 120MM HAS LED TO EARLY CHROMIUM FAILURE.

SOLUTION - AN INTERNAL FIXTURE, ACTING AS A CARRIER FOR THE ANODE AND SOLUTION WILL BE DESIGNED AND FABRICATED. THE UNIT WILL BE CAPABLE OF DEBURRING THE INTERNAL AREA OF THE EVACUATOR HOLES BY USE OF ELECTRO-CHEMICAL POLISHING.

(8347) TITLE - AUTOMATIC RIFLING HEAD ALIGNMENT

175 230

PROBLEM - ALIGNMENT OF THE RIFLING HEAD IS A TIME CONSUMING MANUAL OPERATION REQUIRING OPERATOR SKILL TO DETERMINE GUN BORE POSITION RELATIVE TO THE PERIPHERY OF THE BROACH RIFLING CUTTER BODY.

SOLUTION - APPLICATION OF AN AUTOMATIC PUSH BUTTON ALIGNMENT AND POSITIONING SYSTEM WITH DIGITAL READOUT WILL SUBSTANTIALLY REDUCE THIS OPERATION.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TUBES

(CONTINUED)

(8348) TITLE - SIMULTANEOUS HOOP SHRINKING

PROBLEM - PRESENT SHRINK FITTING OF HOOPS ONTO 8" CANNON TUBES IS ACCOMPLISHED ONE HOOP AT A TIME. THIS INVOLVES INDUCTION HEATING OF THE HOOP, LOWERING IT OVER THE POSITIONED TUBE AND SPRAY COOLING TO SHRINK.

SOLUTION - A VERTICAL SYSTEM TO SIMULTANEOUSLY HEAT THE THREE HOOPS WITH INDUCTION COILS AND LOCATE POSITION AS THE TUBE IS LOWERED INTO THE PIT WILL BE DESIGNED AND FABRICATED. WATER COOLING SYSTEM WILL BE DESIGNED TO SPEED UP COOLING OF THE HOOPS.

450 400

(8349) TITLE - IMPROVED HOLLOW SPINDLE LOADING & UNLOADING

PROBLEM - LOADING AND UNLOADING OF GUN TUBES IN HOLLOW SPINDLE LATHES REQUIRES TWO CRANE LIFTS AND TWO MANUAL MOVES BY THE OPERATOR THAT IS POTENTIALLY HAZARDOUS.

SOLUTION - A CRADLE DEVICE THAT WILL AUTOMATICALLY LOAD THE TUBE INTO POSITION WILL BE DESIGNED, FABRICATED AND FITTED TO PRODUCTION HOLLOW SPINDLE LATHE.

85

(8351) TITLE - IMP MFG OF QUADRANT FLATS & MUZZLE BRAKE

PROBLEM - PRESENT METHODS OF MACHINING FLATS AND KEYWAYS REQUIRE TWO SET-UPS ON TWO SEPARATE MACHINE TOOLS WITH ATTENDANT MATERIEL HANDLING REQUIREMENTS.

SOLUTION - DESIGN A DUAL MACHINING SYSTEM CAPABLE OF MANUFACTURING BOTH THE KEYWAY AND THE LEVELING FLATS IN A SINGLE SET-UP, FABRICATE AND RETROFIT TO CURRENT EQUIPMENT.

88

350

(8352) TITLE - SKIVING OF GUN TUBE BORES

PROBLEM - INTERMEDIATE TUBE BORE HONING OPERATIONS FOR SURFACE FINISH AND SIZE CONTROL ARE A TIME CONSUMING, COSTLY METAL REMOVAL PROCESS. COUNTERBORING OPERATIONS PRIOR TO SWAGE AUTOFRETTAGE ARE ALSO SLOW, TIME CONSUMING, AND HIGH IN TOOLING COSTS.

SOLUTION - THE APPLICATION OF RECENTLY DEVELOPED SKIVING TECHNOLOGY AND EQUIPMENT WILL ELIMINATE COSTLY ROUGH HONING COUNTERBORING OPERATIONS.

120

575

(8354) TITLE - AUTO FLAME CUTTING OF HOT ROTARY FORGED TUBES

PROBLEM - CUT OFF OF MUZZLE AND BREECH ENDS OF ROTARY FORGED FORGINGS IS A BOTTLE NECK OPERATION PRIOR TO HEAT TREATING.

SOLUTION - AUTOMATIC FLAME CUTTING WILL ELIMINATE A BOTTLE NECK OPERATION AND REDUCE CUTTING TIME.

414

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TUBES

(CONTINUED)

(8380) TITLE - CARBON/CARBON COMPOSITE STIFFENED LARGE CALIBER GUN TUBES

350 300 200

PROBLEM - REDUCED WEIGHT WITHOUT REDUCT OF ACCURACY. GRAPHITE FIBER REINFORCED COMPOSITE TUBE STIFFENERS CAN DECREASE WEIGHT AND IMPROVE ACCURACY, THE EPOXY MATRIX MATERIAL, CAN NOT SUSTAIN THE HIGH TEMPERATURE PRODUCED BY REPEATED RAPID FIRINGS.

SOLUTION - CARBON/CARBON COMPOSITES ARE STABLE TO TEMPERATURE FAR IN EXCESS TO THAT OF STEEL. A NEW MATRIX PRECURSOR IMPREGNANT REDUCES PROCESSING REQUIREMENTS SIGNIFICANTLY, THUS MAKING CARBON/ CARBON COMPOSITES A COST COMPETITIVE MATERIAL.

(8421) TITLE - CONTOUR CHEMICAL MILLING PROCESS FOR GUN TUBE FAB.

278 220

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(8423) TITLE - P/M FABRICATION OF GUN TUBES

200 300

PROBLEM - MANUFACTURE OF BARRELS USING IMPROVED MATERIALS WITH RESISTANCE TO WEAR AND EROSION CAUSED BY THERMAL AND CHEMICAL DETERIORATION DESIGNED FOR USE AT ELEVATED TEMPERATURES, UNDER ADVERSE CONDITIONS BY CONVENTIONAL TECHNIQUES IS EXPENSIVE.

SOLUTION - ROTARY SWAGING OF COMPACTED PREFORMS HAS BEEN DONE FOR IRON POWDER COMPACTS IN R&D LABS. THIS TECHNIQUE CAN BE EXTENDED TO FABRICATE PRECISION GUN BARRELS FROM LOW ALLOY-HIGH STRENGTH STEEL POWDERS.

* C A T E G O R Y *

*POLLUTION ABATEMENT *

COMPONENT -- MISCELLANEOUS

(8126) TITLE - SEPARATION OF OILS AND CUTTING FLUIDS FROM WASTE WATER

130

PROBLEM - REMOVAL OF OILS AND CUTTING FLUIDS FROM WASTE WATER IS NECESSARY TO MEET EPA REQUIREMENTS.

SOLUTION - EVALUATE CHEMICAL AND MECHANICAL METHODS FOR OIL AND CUTTING FLUID REMOVAL FROM WASTE WATER.

* C A T E G O R Y *

*QUALITY CONTROL/TESTING *

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- FIRE CONTROL

(8561) TITLE - DIGITAL IMAGE DIAPHRAGMATIC TECHNIQUES

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

COMPONENT -- GUN SYSTEMS

(8136) TITLE - IMPROVE IMPULSE PROGRAMMER FOR HYDRAULIC SIMULATOR

PROBLEM - UNDESIRABLE SHOCK AND VIBRATION IN TESTS OF CERTAIN RECOIL MECHANISMS LIMIT THE EXTENT OF TESTING THAT CAN BE ACCOMMODATED ON THE HYDRAULIC ARTILLERY TEST SIMULATOR.

SOLUTION - DESIGN AND MANUFACTURE IMPROVED IMPULSE PROGRAMMERS TO GET BETTER SIMULATED FIRING THAT WILL BE MORE EFFECTIVE FOR A GREATER NUMBER OF WEAPONS.

(8235) TITLE - AUTOMATIC ADJUSTMENT FOR SIMULATOR ARTILLERY TEST

PROBLEM - HIGH OPERATING COSTS DUE TO NECESSITY OF MANUAL ADJUSTMENT OF VALVES AND OF SPACING BETWEEN SIMULATOR AND WEAPON.

SOLUTION - PROVIDE INCREASED TEST EFFICIENCY BY PROVIDING REMOTE AND AUTOMATIC ADJUSTMENT OF SIMULATOR SPACING TO WEAPON, AND FOR AUTOMATIC ADJUSTMENT OF PRECHARGE PRESSURES.

(8325) TITLE - ROBOTIC EMPLACEMENT DEVICE FOR INSPECTION BY X-RAY (REDIX)

PROBLEM - EXISTING INSPECTION METHODS ARE TIME CONSUMING AND DIFFICULT TO PERFORM. FEASIBILITY OF AUTOMATED MEASUREMENT OF DIMENSION, HARDNESS, AND SURFACE CHARACTERISTICS HAS BEEN SHOWN BUT HAVE NOT BEEN APPLIED IN SMALL CALIBER WEAPONS MANUFACTURE.

SOLUTION - REPLACE THE MANUAL HANDLING AND THE X-RAY FILM, THE GUN CARRIAGE SUB-ASSEMBLIES AND THE X-RAY SOURCE BY AN AUTOMATED ROBOTICS DEVICE TO ALIGN AND INSPECT THE GUN CARRIAGE WELDS.

(8370) TITLE - AUTOMATED INSPECTION OF WEAPONS COMPONENTS

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

80

250 100

648 319

210 360 328

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(8253) TITLE - MACHINE TOOL DYNAMIC MEASUREMENTS AND DIAGNOSTICS

190

PROBLEM - VIBRATIONS IN MACHINE TOOLS, KNOWN AS CHATTER, CAN BE THE CAUSE OF POOR MACHINING OPERATIONS WHICH, IN A HIGH PRODUCTION ENVIRONMENT, CAN RESULT IN MUCH LOST TIME AND DOLLARS.

SOLUTION - DEVELOP A MACHINE TOOL DYNAMIC MEASUREMENTS TECHNIQUE WHICH USES VIBRATION SIGNALS RECEIVED FROM VARIOUS MACHINE LOCATIONS AND IDENTIFIES THE ORIGIN AND MAGNITUDE OF THE VIBRATION. VIBRATION ANALYSIS WOULD INDICATE CORRECTIVE ACTION.

* C A T E G O R Y *

*SMALL CALIBER *

COMPONENT -- BARRELS

(7985) TITLE - SMALL ARMS WEAPONS NEW PROCESS PRODUCTION TECHNOLOGY

239

PROBLEM - GUN BARREL MFG PROCEDURES REFLECT ANTIQUATED TECHNOLOGY AND RELY ON MASS REMOVAL OF MATERIAL BY CONVENTIONAL MACHINING METHODS. CURRENT EQUIP REPRESENTS 1940-50 TECHNOLOGY. NEW MATERIALS COMPOUND THE PROBLEM.

SOLUTION - REDUCE TO PRACTICE NEW TECHNIQUES FOR CAL 50 TO 40MM BARRELS BY ESTABLISHING THE TECHNOLOGY AND PROCESS EQUIPMENT REQUIRED TO BRIDGE GAP BETWEEN CAPABILITIES AND REQUIREMENTS.

(8001) TITLE - RAPID FLOW PLATING OF SMALL CAL GUN TUBES

132

PROBLEM - CHROMIUM PLATING IS A RELATIVELY SLOW PROCESS.

SOLUTION - RAPID SOLUTION FLOW GREATLY INCREASES PLATING RATE.

(8162) TITLE - IMPROVED SC GUN BARREL RIFLING MFG TECHNIQUES

246

PROBLEM - RIFLING SMALL CALIBER GUN BARRELS USES ANTIQUATED TECHNOLOGY (C. 1940-50). AS MANY AS 24 PASSES WITH WAFFER TYPE BROACHES ARE NEEDED. EACH PASS REQUIRES DISASSEMBLY OF SET-UP. EQUIPMENT IN CAL. 50 TO 40MM SIZE IS EXTREMELY LIMITED.

SOLUTION - APPLY AND REDUCE TO PRACTICE THE CONCEPT OF ULTRASONIC EXCITATION OF RIFLING FORMING TOOLS. THE USE OF ULTRASONICS FOR RIFLE FORMING WILL RESULT IN REDUCED FORCES TO FORM RIFLING, IMPROVED FINISH CHARACTERISTICS, AND REQUIRE FEWER PASSES.

FUNDING (\$000)

PRIOR	81	82	83	84	85

COMPONENT -- BARRELS

(CONTINUED)

(8164) TITLE - HIGH SPEED MACHINING OF SC WEAPONS COMPONENTS

PROBLEM - MACHINING SMALL CALIBER WEAPONS COMPONENTS BY CONVENTIONAL METHODS REQUIRES CONSIDERABLE TIME AND IS THE MAIN PORTION OF ITEM COST. ALSO, INDIVIDUAL MACHINE OPERATIONS ARE PERFORMED ON SEPARATE MACHINES REQUIRING EXTENSIVE MANUAL HANDLING.

SOLUTION - HIGH SPEED METAL REMOVAL AND THE COMBINATION OF OPERATIONS FOR STEEL COMPONENTS OF SMALL CALIBER WEAPONS WILL BE INVESTIGATED. BENEFITS INCLUDE REDUCED TIME AND COST, IMPROVED TOOL LIFE, AND IMPROVED SURFACE FINISH.

(8266) TITLE - INVESTMENT CAST LINERS OF SUBSTITUTE ALLOYS

PROBLEM - AN ALTERNATE INVESTMENT-CAST GUN TUBE LINER MATERIAL IS REQUIRED TO SERVE AS A BACKUP AND/OR REPLACEMENT FOR THE CURRENT STRATEGIC COBALT-BASE INVESTMENT CAST ALLOY.

SOLUTION - ESTABLISH VACUUM MELTING AND CASTING CAPABILITIES FOR THE INVESTMENT CASTING OF GUN TUBE LINERS.

(8472) TITLE - ROTARY FORGING OF GUN BARRELS

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(8524) TITLE - REFRACTORY METAL COATING FOR GUN TUBES

PROBLEM - THERE IS A NEED TO PROVIDE IMPROVED RAPID FIRE GUN TUBES, AND A NEED TO REPLACE LINER MATERIALS MADE OF COBALT AND ITS ALLOYS (A CRITICAL STRATEGIC MATERIAL).

SOLUTION - DEVELOP AND OPTIMIZE THE PROCESS VARIABLES OF THE REFRACTORY METAL COATINGS AND THE APPLICATION PROCEDURES OF THESE COATINGS ON GUN BARREL LINERS.

COMPONENT -- COMPONENTS

(8471) TITLE - SQUEEZE CASTING OF SMALL CAL WEAPONS

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(8051) TITLE - APPLICATION AND CONTROL OF MACHINE TOOLS

100 85

PROBLEM - CURRENT PROCEDURES FOR THE JUSTIFICATION, SELECTION, APPLICATION, AND MAINTENANCE OF MACHINE TOOLS ARE INADEQUATE TO AVOID PROCUREMENT OF INEFFICIENT, UNRELIABLE MACHINE TOOLS.

SOLUTION - ESTABLISH AN ACCURATE DEFINITION OF MACHINE TOOL REQUIREMENTS IN RELATION TO COMPONENT MACHINING REQUIREMENTS. DEVELOP PERFORMANCE ANALYSES AND COMPETITIVE PERFORMANCE EVALUATION CRITERIA.

(8163) TITLE - PM STEEL PREFORMS FOR SMALL CALIBER WEAPONS

180

PROBLEM - MANUFACTURE OF WEAPONS COMPONENTS SUCH AS BOLTS AND SPROCKETS HAVE BEEN BY CONVENTIONAL METAL REMOVAL PROCESSES. WHILE NO EQUIPMENT REDUCES MACHINING TIMES, EQUIPMENT COSTS ARE HIGH AND MUCH MATERIAL WASTE OCCURS.

SOLUTION - P/M OFFERS A MEANS OF ACHIEVING NEAR NET SHAPE AT LOW COST. P/M PREFORM APPROACH HAS BEEN SHOWN FOR SIMPLE SHAPES. RECENT ADVANCES IN P/M TECHNOLOGY HAVE DEMONSTRATED THE CAPABILITY OF MANUFACTURING P/M PREFORMS IN COMPLEX SHAPES.

(8324) TITLE - PROCESS CONTROLS FOR P/M WEAPONS COMPONENTS

195 315 200

PROBLEM - PRESENT METHODS OF PRODUCING WEAPON COMPONENTS IS MAINLY BY MACHINING FROM WROUGHT STOCK. THIS IS A HIGH COST METHOD WHICH PRODUCES MUCH ALLOY STEEL SCRAP.

SOLUTION - FORGE PARTS FROM P/M STEEL FOR SAVINGS AND INCREASED DURABILITY AND REDUCED USE OF ALLOY STEEL.

(8468) TITLE - ASSEMBLY & HANDLING TECHNIQUES FOR SMALL CAL WEAPONS

320 350

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

(8525) TITLE - GROUP TECHNOLOGY FOR S/C COMPONENT

300

PROBLEM - NO PROBLEM STATEMENT PROVIDED BY ARRADCOM

SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRADCOM

(8526) TITLE - PROCESSING OF HIGH STRENGTH/LIGHT WEIGHT WEAPONS COMPONENTS

510

PROBLEM - NO PROBLEM STATEMENT PROVIDED BY ARRADCOM

SOLUTION - NO SOLUTION STATEMENT PROVIDED BY ARRADCOM

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL (CONTINUED)

(8528) TITLE - FABRICATION OF COMPOSITE WEAPON COMPONENTS 300

PROBLEM - CONVENTIONAL WEAR RESISTANCE SURFACE COATINGS ARE APPLIED BY ELECTROPLATING AND ARE OFTEN BRITTLE, HAVE VARIABLE COMPOSITION AND STRUCTURE AND ARE LIMITED IN APPLICATION BY GEOMETRICAL CONSTRAINTS.
SOLUTION - EXTEND THE USE OF MULTI-LAYER MATERIALS (COPPER ALLOY/STEEL) PRODUCED BY THE P/M PROCESS WHICH ARE CURRENTLY BEING USED FOR BEARINGS TO FORM WEAR AND EROSION RESISTANT LAYERS.

(8530) TITLE - LIGHTWEIGHT P/M WEAPON COMPONENTS 280

PROBLEM - MODERN WEAPONS REQUIRE THAT MATERIALS HAVE A HIGH SPECIFIC STRENGTH (STRENGTH TO DENSITY RATIO) IN ORDER TO REDUCE THEIR WEIGHT.
SOLUTION - THE AF AND NAVY HAVE DEVELOPED METAL MATRIX COMPOSITE MATERIALS THAT HAVE HIGHER SPECIFIC STRENGTHS THAN STEEL OR ALUMINUM ALLOYS. DEVELOP THE PROCESSING PARAMETERS FOR PRODUCING THESE MATERIALS INTO WEAPON COMPONENTS.

(8569) TITLE - COLD FORGING OF SMALL CAL WEAPON COMPONENTS 240

PROBLEM - NO PROBLEM PROVIDED BY ARRADCOM.

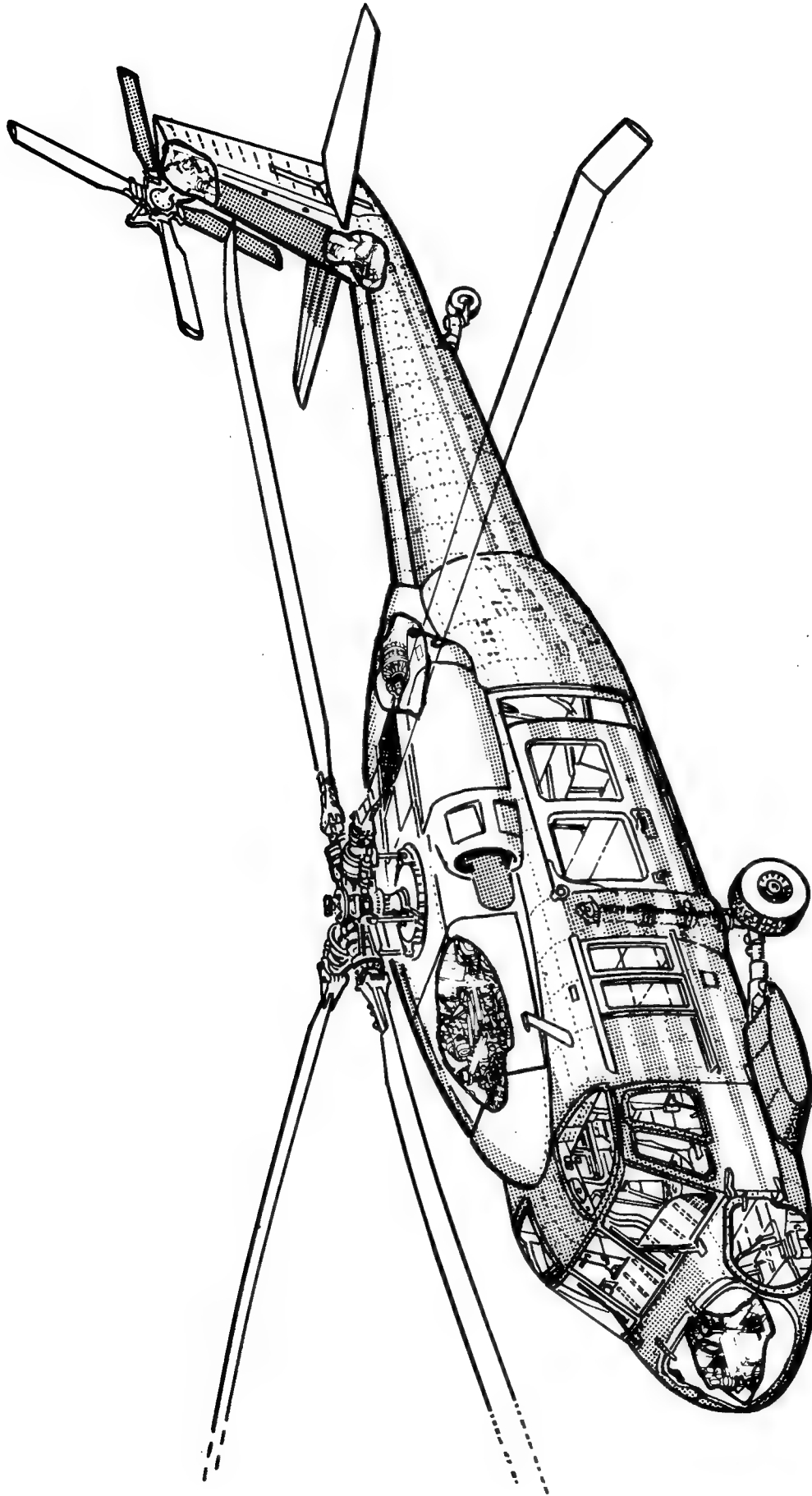
SOLUTION - NO SOLUTION PROVIDED BY ARRADCOM.

COMPONENT -- SPRINGS

(8267) TITLE - STRESS PEENING OF HELICAL COMPRESSION SPRING 209

PROBLEM - THE FATIGUE LIFE AND RELIABILITY OF CRITICAL SPRINGS IN SOME WEAPON SYSTEMS IS LESS THAN DESIRABLE.

SOLUTION - IMPROVE THE FATIGUE LIFE AND RELIABILITY OF THE WEAPON SPRINGS BY OPTIMIZING THE PRODUCTION PROCESS PARAMETERS SUCH AS SHOT SIZE, SHOT INTENSITY, AND SPRING STRESS LEVEL.



**AVIATION R&D COMMAND
(AVRADCOM)**

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US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND

(AVRADCOM)

The US Army Aviation Research and Development Command (AVRADCOM), with headquarters at St. Louis, MO, is responsible for Army aviation research, development, product improvement, acquisition of assigned materiel, initial procurement, and production. The Command directs the Research and Technology Laboratories with headquarters at NASA - Ames Research Center, Moffett Field, CA; US Army Avionics Agency and Laboratory, Fort Monmouth, NJ; Applied Technology Laboratory at Ft. Eustis, VA; US Army Bell Plant Activity, Fort Worth, TX; and the US Army Hughes Plant Activity, Culver City, CA. Three project managers, Aircraft Survivability Equipment, CH-47 Modernization Program, and Navigation/Control Systems, are located at AVRADCOM. PM Advanced Attack Helicopter (AAH) and PM Blackhawk are located at AVRADCOM, but are under the direct control of HQ, DARCOM.

The overall emphasis of the Army's aviation MMT program is to perfect technologies which have a good probability of implementation and high potential benefits. For the most part, efforts are directed towards projects which offer both cost reductions and product improvements. The results of these projects will be made available to other Government agencies and to Industry.

The most important criteria of aircraft materials are strength and low weight. A large part of the aviation MMT program is dedicated to establishing processes to replace metals with materials which have better strength to weight ratios. Composite materials suitable for aviation have been developed and are being used; however, techniques for the production and application of composites need further development to achieve increased use.

The use of composite materials in Army aircraft is anticipated to increase as a result of current work in R&D and MT leading to an all-composite helicopter fuselage. Raw material costs are expected to decrease with the increased use of composites in DOD and Industry. Also, as confidence in the use of composites increases, reservations held by the design and (quality control groups) will diminish, and composites will be incorporated in the earliest stages of weapon development. This will result in increases in MMT work.

Composite projects are planned for virtually every part of the helicopter. Several projects are planned in the airframe area. One will establish manufacturing methods for application of composites to a main fuselage primary structure (the rear fuselage of the Blackhawk). A project planned in the rotor area will establish a manufacturing process for the main rotor blade of the Blackhawk. In the drive area, one project will focus on the drive shaft and another will result in methods for manufacturing a gearbox housing.

Several projects will attack technical problem areas that affect all composite manufacturing. These projects address automation of cutting and layup operations, and improvements in machining, fastening, and new materials. The development of automated techniques will be pursued in cooperation with the Air Force, the lead service in this area.

Perhaps the most significant project areas in terms of advancing composites manufacturing and usage is in the development of improved and new quality control techniques. Projects planned in this area will address materials characterization, in-process controls, and non-destructive evaluation. These projects will ensure optimum processing and material performance, which will increase confidence in composites.

There are many areas in aircraft in which metals can not be replaced. Projects have been submitted to improve production of these items. Since many aircraft metals used in the propulsion system are tough and expensive, machining to final shape is difficult and produces costly scrap. Improving powder metal technology will provide components much closer to final shape, greatly reducing the time and effort to produce the final product. Several projects are included to implement recent advances in gear manufacturing and should provide an improved item at a lower cost. Projects are also planned to find ways of repairing rather than scrapping complex items which are damaged in the manufacturing process. An effort is planned to replace metal turbine blades with ceramic blades. This will provide better operating characteristics at lower cost.

AVRADCOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
AIRFRAME	3222	2092	860	3330	5135
AVIONICS	700	250	0	515	800
DRIVE SYSTEM	860	1149	3085	4215	5130
GENERAL	0	0	200	220	0
ROTOR SYSTEM	2624	4100	3250	1225	2100
TURBINE ENGINE	2437	5418	7890	8320	6520
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TOTAL	9843	13009	15285	17825	19685

 * C A T E G O R Y *

 * AIRFRAME *

MMT FIVE YEAR PLAN
 RCS DRCHT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- FUSELAGE STRUCTURES

(7113) TITLE - COMPOSITE REAR FUSELAGE MANUFACTURING TECHNOLOGY

1210 1179 200

PROBLEM - APPLICATION OF COMPOSITE MATERIALS TO AIRFRAME FUSELAGE COMPONENTS POSSESSES A LARGE POTENTIAL FOR COST AND WEIGHT SAVINGS. HOWEVER, PRODUCTION MANUFACTURING PROCESSES HAVE NOT BEEN ESTABLISHED FOR LARGE, FULL-SCALE, COMPOUND CURVATURE, COMPONENTS.

SOLUTION - PROJECT WILL ESTABLISH TECHNOLOGY FOR FABRICATING MOLDED COMPOSITE REAR FUSELAGE STRUCTURES, WITH EMPHASIS ON BLACKHAWK. LOW COST TOOLING, FORMING MOLDS, AND CO-CURING PROCESSES WILL BE DEVELOPED TO INSURE HIGH REPEATABILITY AND INTEGRITY.

(7338) TITLE - COMPOSITE TAIL SECTION

1885 1090 1700

PROBLEM - THE POTENTIAL COST AND WEIGHT ADVANTAGES OF COMPOSITES FOR AIRFRAME COMPONENTS HAVE NOT BEEN FULLY DEMONSTRATED DUE TO FABRICATION LIMITATIONS RELATED TO CONFIGURATION RESTRAINTS, FOR EXAMPLE, IN-PLACE WINDING, COMPLEX CONTOURS, AND CO-CURING.

SOLUTION - EXPERIMENTAL FABRICATION TECHNOLOGY, DEVELOPED UNDER AN R+D EFFORT, WILL BE REVIEWED AND IMPROVED AUTOMATED MANUFACTURING PROCEDURES WILL BE ESTABLISHED FOR THE YAH-64 HELICOPTOR TAIL SECTION. FILAMENT WINDING IS THE PRIMARY TECHNOLOGY INVOLVED.

(7387) TITLE - LOW COST RADAR CAMOUFLAGE AIRFRAME MATERIAL

100 260

PROBLEM - CURRENT CONST TECH FOR INTEGRAL RADAR CAMOUFLAGED, LOAD BEARING AIRFRAME MATERIALS REQUIRE LABOR INTENSIVE SECONDARY FABRICATION STEPS FOR INTEGRATING CAMOUFLAGED COMPONENTS INTO AIRFRAME STRUCTURES.

SOLUTION - DEVELOP MATERIALS AND CONSTRUCTION TECHNIQUES WHICH PERMIT DIRECT INCORPORATION OF CAMOUFLAGE MATERIALS WITHIN THE COMPOSITE STRUCTURE. THIS WILL REDUCE THE OVERALL COST OF THE AIRFRAME STRUCTURE.

COMPONENT -- GENERAL

(7001) TITLE - MFG TECHNOLOGY FOR AIRFRAME AND SECONDARY STRUCT

3200

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR VARIOUS FAILURES IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE AIRFRAME AND SECONDARY STRUCTURES FROM EXISTING NEW METALLIC OR NONMETALLIC MATERIALS AT SUBSTANTIALLY LOWER COSTS.

COMPONENT -- GENERAL

(CONTINUED)

(7302) TITLE - PROD OF TIB2 COATED LONG LIFE TOOLS

200 60

PROBLEM - AIRFRAME COMPOSITE COMPONENTS REQUIRE EXTENSIVE MACHINING WHICH IS EXPENSIVE IN TERMS OF LABOR HOURS REQUIRED AND TOOL COSTS.

SOLUTION - MANUFACTURE OF TIB2 COATED TOOLS WILL BE SCALED UP FROM LAB-SIZED ELECTROLYTIC CELLS (15 LBS) TO PRODUCTION SIZE (ABOUT 300 LBS) WITH THE CAPABILITY TO PLATE VARIOUS TOOL TYPES AND SHAPES. TOTAL TOOLING COST WILL BE ABOUT 20 PCT OF CURRENT.

(7341) TITLE - STRUCTURAL COMPOSITE FABRICATION GUIDE

50 73

PROBLEM - THE NEED EXISTS TO DOCUMENT INDUSTRY EXPERIENCE IN COMPOSITES SO THAT COST AND MANUFACTURING COMPARISONS CAN BE MADE.

SOLUTION - THE GUIDE WILL PROVIDE INFORMATION IN A SYNERGISTIC FASHION TO PROVIDE PRODUCTION ANALYSIS. PROVIDE PROCESS/COST INTERRELATIONSHIPS AND PROMOTE A THOROUGH MANUFACTURING INTERFACE.

COMPONENT -- MISC COMPONENTS

(7243) TITLE - MACHINING OPERATIONS ON KEVLAR LAMINATES

164 100

PROBLEM - PRESENT METHODS OF MACHINING KEVLAR LAMINATES TEND TO CAUSE DELAMINATION AND EXCESSIVE FUZZING OR FRAYING OF THE CUT EDGES. THIS NECESSITATES THE USE OF TIME CONSUMING AND REPETITIVE TECHNIQUES TO ACHIEVE ACCEPTABLE MACHINED SURFACES.

SOLUTION - EXPERIENCE INDICATES THAT RECENTLY DEVELOPED ADVANCED CUTTING TECHNIQUES, INCLUDING HIGH PRESSURE WATER JET, AND CONVENTIONAL DIAMOND TOOLS HAVE THE ABILITY TO EFFECTIVELY MACHINE KEVLAR WITH INCREASED TOOL LIFE.

(7244) TITLE - LASER CUTTING AND WELDING OF METAL

330

PROBLEM - TECHNIQUES ARE NEEDED THAT WILL REDUCE CUTTING AND WELDING TIMES ON AIRCRAFT PARTS.

SOLUTION - DEVELOP LASER WELDING TO PERMIT RAPID, PRECISE AND STRUCTURALLY SOUND WELDS. DEVELOP LASER CUTTING METHODS TO CUT COMPLEX CORNERS AT HIGH SPEED.

(7396) TITLE - INTEGRAL LOW COST FASTENING SYSTEMS FOR RPV'S

175 150

PROBLEM - JOINING OF COMPONENTS IN RPV SYSTEMS IS ACCOMPLISHED BY THE TRADITIONAL SCREW, NUT, AND BOLT METHODS. UTILIZATION OF THESE METHODS ADD HIGH FABRICATION AND ASSEMBLY COST AND WEIGHT TO THE SYSTEM.

SOLUTION - THIS PROJECT WILL DEVELOP THE TECHNOLOGY FOR UTILIZATION AND INTEGRATION OF PLASTIC FASTENERS, SNAP LATCHES, AND OTHER LOW COST MANUFACTURE AND ASSEMBLY TECHNIQUES INTO THE PRODUCTION OF RPV SYSTEMS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- SECONDARY STRUCTURES

(7183) TITLE - SEMI-AUTO COMPOSITE MFG SYS FOR FUSELAGE SEC STRUCT

609 280 100

PROBLEM - HELICOPTER FUSELAGE STRUCTURES HAVE HIGH MANUFACTURING COST DUE TO HIGH PART COUNT AND HIGH ASSEMBLY COSTS. METHODS OF COMPOSITE FABRICATION HAVE BEEN INVESTIGATED BUT HAND OPERATIONS RESULT IN HIGH LABOR COSTS.

SOLUTION - USE EQUIPMENT AND TECHNIQUES DEVELOPED BY INDUSTRY IN SUPPORT OF AIR FORCE COMPOSITE COMPONENT PROGRAMS. THE SELECTED SYSTEM WILL BE UPDATED AND MODIFIED TO ACCOMMODATE HELICOPTER COMPONENTS WHICH ARE MORE COMPLEX AND HAVE MORE CURVATURE THAN AF COMP.

(7202) TITLE - THERMOPLASTICS FOR HELICOPTOR SECONDARY STRUCTURES

450 100

PROBLEM - FORMING FIBER REINFORCED THERMOPLASTIC COMPONENTS INTO COMPLEX, MULTI-CURVED STRUCTURAL CONFIGURATIONS, WITH UNIFORM FIBER DISTRIBUTION, MINIMUM WARPAGE, AND ACCEPTABLE DIMENSIONAL TOLERANCES HAS NOT BEEN ESTABLISHED FOR AIRCRAFT COMPONENTS.

SOLUTION - EFFORT WILL ESTABLISH TECHNIQUES, SPECIAL TOOLING, AND PROCESSES TO FORM SUCH COMPONENTS WITH VACUUM OR AIR PRESSURE ASSIST METHODS. IN ADDITION, TECHNIQUES TO RESTRAIN THE MATRIX AND FIBER LAYERS IN POSITION DURING HEAT-UP CYCLE WILL BE ESTABLISHED.

(7344) TITLE - RIM MOLDING OF LOW COST SECONDARY STRUCTURES

175 175

PROBLEM - PRESENT METHODS OF FABRICATING AIRCRAFT SECONDARY STRUCTURES (ESPECIALLY ACCESS DOORS) INVOLVE EXCESSIVE LABOR AND EXPENSIVE MATERIALS. STRUCTURES MADE FROM FIBER REINFORCED SANDWICH PANELS AND/OR FORMED SHEET METAL OFTEN REQUIRE COMPLEX ASSEMBLY.

SOLUTION - ESTABLISH A PROCESS TO PRODUCE THESE SECONDARY STRUCTURES FROM REACTION INJECTED MOLDED (RIM) URETHANES. RIM IS A LOW PRESSURE MOLDING TECHNIQUE WHICH CAN USE LOW COST COMPOSITE MOLDS TO GIVE EXTREMELY COST EFFECTIVE STRUCTURES.

(7385) TITLE - COMPOSITE ENGINE INLET

350 400

PROBLEM - MOLDING COMPOSITES TO SHAPES SUCH AS THAT OF THE BLACK HAWK INLET IN PRODUCTION HAS NOT BEEN DEMONSTRATED.

SOLUTION - ESTABLISH A PRODUCT+-- MOLDING PROCESS FOR MANUFACTURING AN INLET COMPOSED OF ALUMINIZED GLASS FIBERS IN A POLYAMINE MATRIX.

(7390) TITLE - FIBER REINFORCED THERMOPLASTIC STRUCTURE

350 250

PROBLEM - HELICOPTER SECONDARY AIRFRAME STRUCTURES ARE EXPENSIVE AND A FREQUENT CAUSE OF DOWNTIME. THE CONTINUAL REPAIR AND REPLACEMENT OF THESE ITEMS IS A MAJOR AIRFRAME OPERATIONAL COST FACTOR.

SOLUTION - ESTABLISH A MANUFACTURING METHOD TO INCORPORATE HIGH STRENGTH AND HIGH MODULUS FIBERS INTO THERMOPLASTIC FOR HELICOPTER STRUCTURES.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- STRUCTURAL MEMBERS

(7193) TITLE - ADV FILAMENT WNDG FOR AIRCRAFT COMPONENTS

350

PROBLEM - CURRENT COMMERCIAL PRACTICES ON FILAMENT WINDING ARE EXPENSIVE.

SOLUTION - A NUMBER OF RECENT DEVELOPMENTS IN FILAMENT WINDING TECHNOLOGY ORIGINATING IN THE U.S., DENMARK, AND HUNGARY SHOW PROMISE OF EXPANDING THE FLEXIBILITY OF THE FILAMENT WINDING PROCESS.

(7342) TITLE - PULTRUSION OF HONEYCOMB SANDWICH STRUCTURES

85 200 92

PROBLEM - FABRICATION OF HONEYCOMB SANDWICH PANELS IS LABOR INTENSIVE AND FACE-TO-CORE BONDING OFTEN TAKES TWO CURE OPERATIONS. PULTRUSION CAN BE USED FOR CONTINUOUS PRODUCTION BUT COMMERCIAL PARAMETERS AND TOOLING ARE NOT SUITABLE FOR MILITARY USE.

SOLUTION - ESTABLISH TECHNOLOGY NECESSARY FOR PRODUCTION PULTRUSION OF SANDWICH STRUCTURES, INCLUDING BEAMS, FOR USE IN COMPOSITE AIRFRAMES. PARAMETERS WILL BE GENERATED AND OPTIMIZED FOR PULTRUDING MILITARY QUALITY FLOORING.

(7373) TITLE - SAND PUNCH SPF OF TITANIUM

300 250

PROBLEM - MANY AIRFRAME PARTS CONSIST OF MULTIPLE DETAILS RIVETED OR SPOT-WELDED TOGETHER THAT INCREASE THE FORMING CYCLE, TOOLING COSTS, AND LABOR. ALSO MANY PART CONTOURS ARE IMPOSSIBLE TO FORM BY CONVENTIONAL METHODS.

SOLUTION - THIS PROJECT WILL DEVELOP A "SAND PUNCH" METHOD OF SUPERPLASTICALLY FORMING TITANIUM ALLOYS AS A PRACTICAL, ECONOMICAL PRODUCTION METHOD.

(7374) TITLE - BI-MATRIX CARBON-CARBON STRUCTURAL COMPONENTS

450 300

PROBLEM - RECENT ADVANCES IN THE DEVELOPMENT OF LASER WEAPONS HAVE REAPPRAISED THE TIMING FOR THE INTRODUCTION OF LASER TACTICAL WEAPONS.

SOLUTION - THIS PROJECT WILL DEVELOP THE MANUFACTURING TECHNOLOGY NECESSARY FOR PRODUCTION AND RETROFIT OF BI-MATRIX CARBON-CARBON STRUCTURAL COMPONENTS. BI-MATRIX C-C IS A HIGH STRENGTH LIGHTWEIGHT INTEGRAL HIGH ENERGY LASER PROTECTIVE BARRIER SYSTEM.

(7389) TITLE - SUPERPLASTIC FORMING OF ALUMINIUM COMPONENTS

300 400 200

PROBLEM - CURRENT METHODS OF MACHINING ALUMINIUM FORGINGS ARE EXPENSIVE AND REQUIRE AN EXCESSIVE NUMBER OF PARTS.

SOLUTION - ESTABLISH FABRICATION TECHNOLOGY NECESSARY TO MANUFACTURE ALUMINIUM AIRFRAME COMPONENTS THRU THE APPLICATION OF SUPERPLASTIC FORMING OF ALUM ALLOY SHEET MATERIAL.

FUNDING (\$000)

PRIOR 81 82 83 84 85

(CONTINUED)

COMPONENT -- STRUCTURAL MEMBERS

(7414) TITLE - JOINING OF REIN THERMOPLASTIC COMPOSITE STRUCT

PROBLEM - UTILIZATION OF FIBER REINFORCED THERMOPLASTIC RESIN SYSTEMS TO FORM STRUCTURAL ELEMENTS CURRENTLY ARE JOINED BY ADHESIVE BONDING WHICH TAKES HOURS TO CURE.

SOLUTION - USE LOW COST DIRECT MATERIAL JOINING METHODS SUCH AS ULTRASONIC SEAM OR SPOT WELDING, DIRECT THERMAL FUSION, ETC FOR REINFORCED THERMOPLASTIC STRUCTURAL ELEMENTS.

100

COMPONENT -- STRUCTURAL PANELS

(7359) TITLE - POLYIMIDE FOAM FOR MULTIFUNCTIONAL AIRCRAFT STRUCT

PROBLEM - NOMEX/POLYIMIDE FOAM HAS BEEN DEVELOPED AS A STRUCTURAL CORE FOR MULTIFUNCTIONAL AIRCRAFT SANDWICH STRUCTURES. CHOPPED GLASS AND GRAPHITE ARE INCORPORATED INTO THE FOAM TO GIVE REQUIRED CHARACTERISTICS. PRODUCTION IS HIGH COST WITH LARGE VARIATIONS.

SOLUTION - AN AUTOMATED FOAM DISPENSING UNIT WILL BE COMBINED WITH HONEYCOMB FORMING AND SHAPING EQUIPMENT TO FORM CURVED OR COMPLEX SHAPED HONEYCOMB CORE WITH CURED POLYIMIDE FOAM IN PLACE. MICROWAVE, RF, OR FORCED AIR WILL BE USED FOR CURING.

175 175

(7395) TITLE - HAND HELD WATER JET CUTTING

PROBLEM - CONVENTIONAL METHODS OF CUTTING FLAT AND FORMED COMPOSITE AND NONMETALLIC PANELS RESULTS IN RAPID TOOL WEAR AND HIGH DUST LEVELS. WHEN USED ON KEVLAR FUZZING OF EDGES OCCURS RESULTING IN SECONDARY OPERATIONS.

SOLUTION - THIS PROJECT WILL DEVELOP A HAND HELD WATER JET CUTTER TO BE USED FOR CUTTING COMPOSITES.

150 100

* C A T E G O R Y *

*AVIONICS *

COMPONENT -- DISPLAYS

(7319) TITLE - MULTI-LEGEND DISPLAY SWITCH (MLD/S)

PROBLEM - EXPERIMENTAL VERSIONS ARE EXPENSIVE AND DIFFICULT TO MANUFACTURE BECAUSE THE MOUNTING OF THE COMMERCIALY AVAILABLE ELECTRONICS DISPLAY CHIPS AND SWITCHES MUST BE DONE BY HAND TO OBTAIN PROPER RUGGEDNESS AND OPERATION OF THE STRUCTURE.

SOLUTION - MAKE THE MLD/S A MANUFACTURABLE ITEM SO THAT IT CAN BE MADE ROUTINELY AVAILABLE FOR INCORPORATION IN AVIONIC SYSTEMS. ESTABLISH THE MANUFACTURING TECHNIQUES TO PROPERLY MOUNT, ALIGN, AND FABRICATE MILITARIZED DISPLAYS AND SWITCHES. //

50

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(7293) TITLE - MOLDED WAVEGUIDE PARTS FOR ANTENNAS

265

PROBLEM - PHASED ARRAY ANTENNAS ARE TYPICALLY VERY EXPENSIVE AND HEAVY. THEREFORE, MECHANICALLY SCANNED ANTENNAS HAVE BEEN PREFERRED FOR ARMY AIRBORNE APPLICATIONS. THE ARRAY ANTENNA WAVEGUIDE IS A PRIME CONTRIBUTOR TO WEIGHT AND COST.

SOLUTION - BY USING INJECTION MOLDING AND METALIZATION OF THE COMPOSITE FORM LESS EXPENSIVE AND LIGHTER WEIGHT WAVEGUIDES CAN BE FABRICATED.

(7412) TITLE - INFRARED DETECTOR FOR LASER WARNING RECEIVER

100 650 250

PROBLEM - SUPPLY OF GALLIUM ARSENIDE ETALONS FOR USE AS IR DETECTORS IS LIMITED. METHODS FOR DIFFUSING THE DETECTOR JUNCTION, FOR SURFACE PASSIVATION, FOR BONDING THE INTERDIGITATED ETALON TO THE INTERDIGITATED DETECTOR ARE LARGELY HAND METHODS.

SOLUTION - DEVELOP ALTERNATE SOURCES OF GA-AS MATERIAL, AND AUTOMATE METHODS FOR CONTROLLING JUNCTION DIFFUSION, FOR PASSIVATION, AND FOR BONDING LEADS TO THE DETECTOR ARRAY. BUILD SAMPLE DETECTORS.

(7418) TITLE - COMPOSITE ELECTRO-OPTICAL SYSTEM(EOS)

250 800

PROBLEM - MECHANICAL RIGIDITY, STABILITY, OVERALL WEIGHT, AND COSTS ARE PRINCIPLE AREAS AFFECTING THE UTILITY AND AFFORDABILITY OF SOPHISTICATED EOS'S.

SOLUTION - A COMPOSITE BASED EOS WILL BE FABRICATED UTILIZING THE RESULTS OBTAINED IN THE SLOS PROGRAM.

* C A T E G O R Y *

* DRIVE SYSTEM *

COMPONENT -- BEARINGS

(7334) TITLE - ESTABLISH MANTECH FOR POWDER PROC ROLLING BEARINGS

190 140

PROBLEM - LIFE IMPROVEMENTS CONDUCTED ON POWDER PROCESSED AISI M50 STEEL HAVE BEEN OBSERVED WHEN COMPARED TO WROUGHT CONSUMABLE VACUUM ARC REMELTED (CVM) AISI M50 STEEL.

SOLUTION - DEVELOP ECONOMICALLY SOUND PRODUCTION PROCEDURES FOR QUALITY ASSURANCE OF THE POWDER, PRESSING AND SINTERING, AND SUBSEQUENT OPERATIONS TO MANUFACTURE FINISHED COMPONENTS. THE COMPONENTS WILL BE PRESSED TO NEAR NET SHAPE.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GEARS

(7063) TITLE - MANUFACTURING TECHNOLOGY FOR DRIVE PARTS AND COMP

1500

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR FAILURE IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE METALLIC AND NON-METALLIC DRIVE PARTS FROM EXISTING OR NEW MATERIALS TO INCREASE RELIABILITY AND DECREASE LIFE CYCLE COSTS.

(7155) TITLE - COST EFFECTIVE MFG METHODS FOR HELICOPTER GEARS

570 320

PROBLEM - DEMAND IN HELICOPTER OPERATION OF GREATER RELIABILITY OF HIGH PERFORMANCE GEARS AT LOWER COST HAS REQUIRED THAT IMPROVED PROCESSING AND EVALUATION TECHNIQUES BE INSTITUTED.

SOLUTION - PROJECT WILL ADDRESS THE TOTAL GEAR MANUFACTURING PROCESS, INTEGRATING AVAILABLE NON-DESTRUCTIVE INSPECTION PROCEDURES AND REPLACING INDIVIDUAL TOOTH GRINDING WITH A COMBINATION OF AUSROLLING AND A FINAL ROTARY TOOTH FINISHING PROCEDURE.

(7189) TITLE - POWDER METALLURGY GEARS FOR GAS TURBINE COMPONENTS

200 250 300

PROBLEM - NEW HIGH TEMPERATURE GEAR MATERIALS NOW PLANNED FOR SERVICE IN HELICOPTER DRIVE TRAINS ARE BECOMING INCREASINGLY DIFFICULT TO PROCESS DUE TO THEIR HIGHER ALLOY CONTENT. AS THE DIFFICULTY INCREASES, SO DOES THE COST.

SOLUTION - POWDER METAL NEAR NET SHAPE PROCESSING COUPLED WITH ADVANCED SURFACE PROCESSING REPRESENTS THE BEST APPROACH FOR THESE MATERIALS. THIS PROJECT WILL ESTABLISH A FULL MANUFACTURING AND QUALITY ASSURANCE SEQUENCE.

(7267) TITLE - LOW COST GEARS FOR TURBINE ENGINES AND ACC GEARBOX

415 160

PROBLEM - CURRENT PRODUCTION METHODS FOR AIRCRAFT GEARS DO NOT TAKE FULL ADVANTAGE OF THE ADVANCED TECHNOLOGICAL PROCESSES AVAILABLE.

SOLUTION - DEMONSTRATE THE ECONOMY OF USING ADVANCED TECHNOLOGICAL PROCESSES SUCH AS ORBITAL PRECISION FORGING, LASER OR ELECTRON BEAM HARDENING, ROLL-FORMED GEAR TEETH AND POT BROACHING IN THE MANUFACTURE OF AIRCRAFT GEARS.

(7298) TITLE - EVALUATION OF HIGH TEMPERATURE CARBURIZING

175 75 350 400

PROBLEM - GEAR CARBURIZING IS PRESENTLY CARRIED OUT WITH A RELATIVELY SLOW ENDOTHERMIC PROCESS, TYPICALLY AT 1700 DEG F, WHICH REQUIRES SURFACE PROTECTION AGAINST DECARBURIZING DURING THE CYCLE OR A POST HEAT TREAT REMOVAL OF THE DECARBURIZED LAYER.

SOLUTION - REDUCE PROCESSING TIME BY INCREASING THE OPERATING CAPACITY. ALSO INVESTIGATE VACUUM CARBURIZING AND HARDING OF VARIOUS GEAR CONFIGURATIONS IN ORDER TO PRODUCE A MORE UNIFORM CARBON PROFILE OF GEAR TEETH.

MMT FIVE YEAR PLAN
RCS DRCHT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GEARS

(CONTINUED)

(7325) TITLE - AUTO LASER INSPECTION OF SPIRAL BEVEL GEARS

250

PROBLEM - THE CONTROL OF TOOTH GEOMETRY IN SPIRAL BEVEL GEARS REQUIRES EXTENSIVE MANUAL INSPECTION AND CHECKS RELATIVE TO MASTER GEARS. THE ACCEPTANCE / REJECTION CRITERIA ARE HIGHLY SUBJECTIVE AND IMPACT THE PRODUCT'S USEFUL LIFE.

SOLUTION - APPLY LASER MEASUREMENT TO THE SURFACE OF SPIRAL BEVEL GEARS. THIS WILL AUTOMATE THE INSPECTION TECHNIQUES AND PROVIDE BETTER QUALITY CONTROL WITH REDUCTION IN INSPECTION TIME.

(7376) TITLE - AUTO INSPECT AND PRECISION GRINDING OF SB GEARS

500

PROBLEM - CURRENT MFG METHOD FOR SPIRAL BEVEL GEARS IS LABOR INTENSIVE REQUIRING CONTACT PATTERN CHECKS WITH EXPENSIVE MASTER MATING GEARS. THE PATTERN SHIFTS WITH A CHANGE IN TORQUE AND TEMPERATURE, AS A RESULT, THE TOOTH FORM EXPERIENCES GREAT STRESS.

SOLUTION - DEVELOP AN AUTOMATED PROD PROCESS OF GRINDING SPIRAL BEVEL GEARS BY TAPE CONTROLLED MACHINES, BASED ON A COORDINATE SYS MADE POSSIBLE BY A PARTIAL NON-INVOLUTE TOOTH FORM.

215 499

215

(7394) TITLE - DOUBLE HELICAL GEAR

330 375

PROBLEM - THE LIFE LIMITING FAILURE MODE OF AIRCRAFT GEARS IS GEAR TOOTH PITTING OR SPALLING. THE DOUBLE HELICAL GEAR PLANETARY SYSTEM WILL UPGRADE PERFORMANCE OF THE TRANSMISSION.

SOLUTION - THIS PROJECT WILL ESTABLISH THE MANUFACTURING PROCESS TO PRODUCE THE ONE-PIECE DOUBLE-HELICAL GEAR PLANETARIES BY SHAPING, SHAVING, HARDENING, AND HONING TO REDUCE TRANSMISSION FAILURE RATES.

(7398) TITLE - COMPUTER CONTROLLED GEAR CROWNING

200

PROBLEM - PRESENT TECHNOLOGY OF GRINDING CROWNED SPUR GEARS IS BASED ON COMPUTER AIDED USAGE. A PRECISION MICROPROCESSOR CONTROLLED STEPPER MOTOR SYSTEM TO CORRELATE THE MOVEMENT OF WHEEL AND WORK TABLE IS NEEDED FOR INCREASED ACCURACY

SOLUTION - DEVELOP A MICROPROCESSOR CONTROLLED STEPPER MOTOR SYSTEM TO PERFECT THE GEAR CROWNING TECHNOLOGY.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(7324) TITLE - FREEWHEEL SPRING CLUTCH MANUFACTURING PROCESS

PROBLEM - WITH THE HIGH OUTPUT SPEED OF TODAY'S ENGINES, THE NEED EXISTS FOR A COST EFFECTIVE FABRICATION PROCESS OF HIGH SPEED OVERRUNNING CLUTCHES TO BE USED IN HELICOPTER TRANSMISSIONS.

SOLUTION - DEVELOP A PROCESS TO PRODUCE HELICAL SPRINGS WITHOUT THE NEED OF "START-STOP" HOLES WHICH CREATE AN IMBALANCE AND STRESS CONCENTRATION UTILIZING METAL MACHINING PROCESSES.

250

COMPONENT -- SHAFTS

(7108) TITLE - MFG TECHNIQUES FOR TRANSMISSION SHAFT SEALS

135 100

PROBLEM - CURRENT HELICOPTER TRANSMISSION SEALS ARE SUSCEPTABLE TO WEAR AND THERMAL DEGRADATION RESULTING IN LEAKAGE OF TRANSMISSION OIL AND FREQUENT SEAL REPLACEMENT.

SOLUTION - INTEGRAL MOLDING OF A HYBRID ELASTOMERIC SEGMENTED CARBON RING SEAL COMBINES THE COMPLIANCE OF ELASTOMERIC TIP SEALS WITH THE WEAR RESISTANCE AND TEMPERATURE TOLERANCE OF MECHANICAL CARBON SEALS.

(7326) TITLE - ADAPT OF ELECTRON BEAM WELDING FOR REPAIR SHAFTS

200 350

PROBLEM - DURING OVERHAUL OF HELICOPTER TRANSMISSIONS THE PERCENTAGE OF PART REJECTION FOR SPLINE WEAR IS HIGH FOR GEARS WITH SPLINE INTEGRAL SHAFTS.

SOLUTION - ESTABLISH THE TOOLING AND INSPECTION PROCEDURES FOR ELECTRON BEAM (EB) WELDING OF COMPLEX GEAR SHAFT/SPLINE ELEMENTS. BY THIS METHOD THE MOST EXPENSIVE ELEMENT (THE GEAR) CAN BE SAVED BY A SINGLE LOW COST WELD OF A NEW SPLINE TO THE GEAR/SHAFT.

COMPONENT -- TRANSMISSION HOUSING

(7354) TITLE - INTEGRALLY STIFFENED HELICOPTER TRANS CASE

150 300 650 1500 1300

PROBLEM - THE LOW STIFFNESS OF THE CURRENT CH-47 CAST MAGNESIUM ALLOY TRANSMISSION CASE CAUSES EXCESSIVE GEAR WEAR, EXCESSIVE NOISE AND EXCESSIVE VIBRATION.

SOLUTION - THIS PROJECT WILL ESTABLISH THE MANUFACTURING PROCESS FOR CASTING FIBER REINFORCED, INTEGRALLY STIFFENED CH-47 TRANSMISSION CASES.

(7378) TITLE - STAINLESS STEEL FABRICATED HOUSING

600 1280

PROBLEM - HELICOPTER TRANSMISSION HOUSINGS ARE MADE FROM MAGNESIUM CASTINGS. THEY ARE COSTLY AND HAVE HIGH REPLACEMENT RATES AT OVERHAUL DUE TO CRACKS AND CORROSION.

SOLUTION - APPLY VARIOUS FABRICATION TECHNIQUES TO VARIOUS MATERIALS SUCH AS STAINLESS STEEL TO PRODUCE A LIGHTER WEIGHT, NON-CORROSIVE, AND LESS COSTLY HOUSING.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TRANSMISSION HOUSING

(CONTINUED)

(7384) TITLE - COMPOSITE ENGINE GEARBOX

PROBLEM - CONVENTIONAL GEAR HOUSINGS CONSISTING OF MAGNESIUM EXHIBIT LOW MODULUS, LOW FATIGUE STRENGTH, AND SUSCEPTABILITY TO CORROSION.

SOLUTION - ESTABLISH A COST EFFECTIVE FILAMENT WINDING MANUFACTURING METHOD FOR A GRAPHITE FIBER/HIGH TEMPERATURE RESIN COMPOSITE HOUSING.

* C A T E G O R Y *

*GENERAL *

COMPONENT -- ALL

(7343) TITLE - CONTROLLED LEAK PRESSURE PROCESS

PROBLEM - LIGHTWEIGHT COMPOSITE STRUCTURES ARE TYPICALLY COMPOSED OF A NOMEX CORE WITH BONDED FIBER REINFORCED SKINS. THE CORE MATERIAL AND ASSOCIATED MACHINING IS COSTLY AND SHOULD BE ELIMINATED.

SOLUTION - THE CONTROLLED LEAK PRESSURE PROCESS PROVIDES A MEANS OF PRODUCING "HOLLOW" STRUCTURES WITHOUT THE USE OF A PRESSURE BAG OR CORE MATERIAL. THE ULTIMATE RESULT IS A LIGHTWEIGHT, HOLLOW CORE, INTEGRALLY STIFFENED STRUCTURE.

COMPONENT -- SAFETY

(7022) TITLE - PDN OF POLYPHOSPHAZENE FIRE RESIST HYDRAULIC FLUIDS

PROBLEM - CURRENT HYDRAULIC FLUIDS THAT MEET REQUIRED PERFORMANCE SPECIFICATIONS ARE FLAMMABLE.

SOLUTION - THE DEVELOPMENT OF PHOSPHAZENE FLUIDS DEMONSTRATE THERMAL STABILITY, VISCO-ELASTIC PROPERTIES, AND FIRE RESISTANCE. THIS WOULD INCREASE THE FIRE SAFETY OF ARMY AIRCRAFT.

* C A T E G O R Y *

*ROTOR SYSTEM *

200

220

375 250

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- BLADE

(7403) TITLE - ELECTRONIC BLADE BALANCE SYSTEM

PROBLEM - THE STATIC BALANCING OF ROTOR BLADES USING CURRENT METHODS RESULTS IN A SIGNIFICANT DIRECT LABOR AND ELAPSED TIME EXPENDITURE.

SOLUTION - DEVELOP A COMPUTER ASSISTED ELADE BALANCE MACHINE WHICH DETERMINES THE AMOUNT AND LOCATION OF CORRECTIVE BALANCE WEIGHT ADDITIONS.

275 250

COMPONENT -- BLADE/COMPOSITE STRUCTURES

(7266) TITLE - DET OF OPTIMAL CURE COND FOR PROC FIRER REIN COMPO

PROBLEM - CURRENT METHODS OF CURING COMPOSITES ARE BASED ON EMPIRICAL DETERMINATION OF REQUIRED PROCESSING CONDITIONS. A TRIAL AND ERROR PROCEDURE IS FOLLOWED UNTIL THE MANUFACTURER IS REASONABLY SATISFIED WITH MECHANICAL PROPERTIES.

SOLUTION - BY DEVELOPING AND EMPLOYING IMPROVED METHODS OF DETERMINING REQUIRED PROCESSING CONDITIONS FOR COMPOSITES, TIME AND PRODUCTIVITY CAN BE IMPROVED IN THE MOLD.

225 175

(7339) TITLE - COMPOSITE TAIL ROTOR BLADE

PROBLEM - FILAMENT WINDING FROM A SOLID FLEXBEAM TO AN OPEN SPAR SECTION, WINDING TO NET SHAPE, IMPROVED RESIN CONTROL AND TOLERANCE CONTROL MUST BE OBTAINED TO ENHANCE THE COST EFFECTIVENESS OF FLEXBEAM TAIL ROTERS.

SOLUTION - TECHNIQUES WILL BE DEVELOPED FOR CONTINUOUS FILAMENT WINDING FROM OPEN TO CLOSED SECTIONS, WINDING NET CONTOUR SHAPE, OPTIMIZING TOLERANCE CONTROL WITH IMPROVED TOOLING, AND IMPROVED RESIN CONTROL TO ENSURE MINIMUM WEIGHT COMPONENTS.

1807 780 600

(7340) TITLE - COMPOSITE MAIN ROTOR BLADE

PROBLEM - CURRENT PRODUCTION COMPOSITE BLADE PROGRAMS HAVE NOT BEEN ORIENTED TOWARD OPTIMIZING MANUFACTURING TECHNIQUES/PROCESSES RELATED TO BLADE CONFIGURATIONS, FABRICATION METHODS, AND IMPROVED STRUCTURAL RELIABILITY.

SOLUTION - IMPROVED METHODS WILL INCLUDE SOFT INFLATABLE MANDRELS, INCREASE IN FIBER BAND WIDTH, IMPROVED MATRIX CONTROL PROCEDURES, BALANCED SHELL TOOLING, AND NET SHAPE WINDING.

2970 734 300

(7362) TITLE - LOW COST COMPOSITE MAIN ROTOR BLADE FOR THE UH-60A

PROBLEM - MANUFACTURING TECHNOLOGY FOR COCURING GLASS AND GRAPHITE FILAMENT WOUND MAIN ROTOR BLADES HAS NOT BEEN ESTABLISHED FOR THE PRODUCTION ENVIRONMENT.

100 900 2200 2450

SOLUTION - DEVELOP FILAMENT WINDING TECHNOLOGY FOR FABRICATING D SPARS THROUGH OPTIMIZED WINDING OF WET FILAMENTS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

(CONTINUED)

COMPONENT -- BLADE/COMPOSITE STRUCTURES

(7388) TITLE - MANUFACTURING PROOF TESTING OF COMPOSITE ROTOR BLADES

PROBLEM - THERE IS A LACK OF A TECHNIQUE WHICH CAN ADEQUATELY DETERMINE STRUCTURAL INTEGRITY OF COMPOSITE MAIN ROTOR BLADES AT THE CONCLUSION OF THE FABRICATION CYCLE.

SOLUTION - ESTABLISH AN ACOUSTIC EMISSION TECHNIQUE FOR PROOF TESTING COMPOSITE ROTOR BLADES.

250 275

COMPONENT -- BLADE/LEADING EDGE

(7175) TITLE - AUTO BLADE CONTOUR INSP CCM AIDED INSPECTION

PROBLEM - MEASUREMENT OF THE CONTOUR OF CERTAIN HELICOPTOR SURFACES ARE REQUIRED TO BE MADE WITH A HIGH DEGREE OF ACCURACY ON SURFACES WITH WIDTHS UP TO 42 INCHES AND AT A LARGE NUMBER OF POINTS. AVAILABLE SYSTEMS ARE SUSCEPTIBLE TO ERRORS.

SOLUTION - PROVIDE A COMPUTER AIDED, NONCONTACTING OPTICAL GAUGING SYSTEM TO AUTOMATICALLY INSPECT CONTOURS OF SPARS AND AIRFOILS OF HELICOPTOR ROTOR BLADES. THIS METHOD WILL INCREASE ACCURACY, REDUCE TIME REQUIRED BY 1/3 AND PROVIDE REPRODUCIBLE INSPECTION.

275

COMPONENT -- BLADE/SPAR

(7360) TITLE - EXTRUSION OF PRECISION HOLLOW AIRCRAFT COMPONENTS

PROBLEM - SOME HOLLOW COMPONENTS, SUCH AS TITANIUM BLADE SPARS, ARE MANUFACTURED FROM SHEET BY WELDING A TUBE AND HOT FORMING. THIS IS A VERY EXPENSIVE TECHNIQUE.

SOLUTION - CAD/CAM TECHNIQUES, RECENTLY DEVELOPED FOR EXTRUSION OF SOLID SHAPES, CAN BE APPLIED TO HOLLOW TO IMPROVE EXTRUSION TOLERANCES AND REDUCE MANUFACTURING COSTS.

250 200

COMPONENT -- HUB

(7241) TITLE - HOT ISOSTATICALLY PRESSED TITANIUM CASTINGS

PROBLEM - THE CURRENT METHOD OF MANUFACTURING ROTOR HUBS RESULTS IN EXCESSIVE USE OF MATERIALS AND MACHINING. PROJECT FOR FABRICATION OF A COMPOSITE MAIN ROTOR HUB HAS BEEN CANCELLED. THE CURRENT FORGED HUB IS A LONG-LEAD TIME ITEM.

695 500

SOLUTION - ESTABLISH THE MANUFACTURING PROCESS FOR HOT ISOSTATIC PRESSING (HIP) OF A CAST BLACKHAWK TITANIUM ROTOR HUB. THE REQUIRED MATERIAL PROPERTIES ARE ATTAINABLE AND A COST SAVINGS OF 36 PERCENT IS EXPECTED.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

(CONTINUED)

COMPONENT -- HUB

(8139) TITLE - COMPOSITE MAIN ROTOR HUB

PROBLEM - UNACCEPTABLE SIZE AND WEIGHT PENALTIES ARE INCURRED WHEN CONVENTIONAL METALLIC MATERIALS ARE USED FOR ADVANCED HUB DESIGNS.

SOLUTION - DEVELOP THE FABRICATION TECHNOLOGY, TOOLING AND AUTOMATED TECHNIQUES NECESSARY TO MANUFACTURE COMPOSITE ROTOR HUBS.

225 750

COMPONENT -- MISC COMPONENTS

(7004) TITLE - MFG TECHNOLOGY FOR ROTOR ITEMS AND ASSOCIATE COMPS

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR VARIOUS FAILURES IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MFG ROTOR ITEMS AND ASSOCIATED COMPONENTS FROM EXISTING OR NEW MATERIALS THAT WILL INCREASE RELIABILITY AND REDUCE LIFE CYCLE COSTS.

850

(7119) TITLE - NON-DESTRUCTIVE EVAL TECHNIQUES FOR COMPOSITE STRUCTURES

PROBLEM - IMPLEMENTATION OF COMPOSITE STRUCTURES IN THE ARMY AIRCRAFT IS DEPENDANT UPON THE ABILITY TO DETECT AND EVALUATE DEFECTS.

SOLUTION - ESTABLISH A VIABLE AND COMPREHENSIVE IN-PROCESS INSPECTION PROGRAM FOR NON-DESTRUCTIVE INSPECTION OF COMPOSITE STRUCTURES.

1231 500

(7345) TITLE - IN-PROCESS CONTROL OF RESIN MATRIX CURE

PROBLEM - CONVENTIONAL CONTROL OF THE CURE STAGE DURING COMPOSITE HARDWARE MANUFACTURING IS ATTAINED THROUGH MANUAL OR AUTOMATIC CONTROL OF THE AUTOCLAVE/PRESS TEMPERATURE AS A FUNCTION OF TIME. THIS METHOD IGNORES THE CHEMICAL STATE OF THE RESIN DURING CURE.

35 300 225

SOLUTION - USE IN-PROCESS CONTROL TECHNIQUES CAPABLE OF MONITORING THE RESIN FLOW/CURE BEHAVIOR TO INSURE PRODUCTION OF COMPONENTS HAVING CONSISTENTLY HIGH QUALITY.

* C A T E G O R Y *

TURBINE ENGINE

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- CERAMIC COMPONENTS

(7268) TITLE - CERAMIC TURBINE STATOR PARTS

875 1510

PROBLEM - EXPENSIVE ALLOYS WITH EXOTIC ELEMENTS ARE CURRENTLY REQUIRED TO EXTEND THE OPERATING TEMPERATURE OF METALLIC ENGINE COMPONENTS TO 2500 F.

SOLUTION - DEVELOP AND DEMONSTRATE THE ECONOMICAL OPERATION OF CERAMIC COMPONENTS FOR HIGH TURBINE TEMPERATURE APPLICATION.

(7350) TITLE - CERAMIC COMPONENTS FOR TURBINE ENGINES

1500 2420 1210

PROBLEM - METAL BLADES/VANES FOR TURBINE ENGINES ARE HIGH COST, USE CRITICAL MATERIALS, AND HAVE UNACCEPTABLE TEMPERATURE LIMITATIONS. CERAMIC MATERIALS WHICH HAVE BETTER PROPERTIES ARE NOT USED BECAUSE OF NON-REPRODUCIBLE PROPERTIES AND SHAPE LIMITATIONS.

SOLUTION - SILICON NITRIDE FORMED BY INJECTION MOLDING AND REACTION BONDING IS SUITABLE FOR VANES, AND SILICON CARBIDE FORMED BY INJECTION MOLDING AND PRESSURELESS SINTERING HAS TEMPERATURE AND PRESSURE CHARACTERISTICS SUITABLE FOR BLADES.

(7400) TITLE - ZIRCONIA SHROUD PRODUCTION SCALE-UP

300 210 150

PROBLEM - THE ABILITY TO PRODUCE IMPROVED PERFORMANCE ZIRCONIA TURBINE SHROUDS IN A PRODUCTION ENVIRONMENT HAS NOT BEEN DEMONSTRATED.

SOLUTION - THIS PROJECT WILL DEVELOP A SCALED-UP AND REPRODUCIBLE MANUFACTURING PROCESS FOR THERMALLY SPRAYED ZIRCONIUM OXIDE.

COMPONENT -- COMBUSTOR

(7322) TITLE - LOW COST TRANSPIRATION COOLED COMBUSTOR LINER

50 300 300

PROBLEM - COMBUSTOR LINERS OF ADVANCED GAS TURBINE ENGINES ARE REQUIRED TO SURVIVE USING LESS COOLING AIRFLOW THAN HERETOFORE AVAILABLE. STATE OF THE ART TRANSPIRATION COOLED LINERS CAN MEET THE REQUIREMENTS BUT MANUFACTURING PROCESSES ARE NOT COST EFFECTIVE.

SOLUTION - REFINE A LOW-COST MANUFACTURING TECHNIQUE TO FORM THE NECESSARY COMPLEX SHAPES AND COOLING PASSAGES. PROCESS WILL BE USABLE WITH COMMON COMBUSTOR LINER ALLOYS TO BE CONSISTENT WITH THE LOW-COST CONCEPT BEING PURSUED. JOINING WILL ALSO BE REFINED.

(7377) TITLE - SPF/DB STATIC STRUCTURE FOR TURBINE ENGINES

400 600

PROBLEM - TITANIUM STATIC COMPONENTS OF TURBINE ENGINES USE FORGINGS OR CASTINGS WELDED TO SHEET STOCK AND MACHINED ALL OVER. THIS PROCESS IS TOO COSTLY AND HAS POOR UTILIZATION OF CRITICAL MATERIAL.

SOLUTION - ADAPT THE SPF/DB TECHNOLOGY TO THE MANUFACTURE OF A TITANIUM STATIC COMPONENT OF A TURBINE ENGINE.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- COMPRESSOR

(7036) TITLE - ISOTHERMAL ROLL FORGING OF COMPRESSOR BLADES

993 185

PROBLEM - TECHNOLOGY FOR FABRICATING ADVANCED ENGINE MATERIALS INTO COMPRESSOR BLADE CONFIGURATIONS IS EITHER UNAVAILABLE OR EXCESSIVE IN COST.

SOLUTION - ISOTHERMAL ROLL FORGING IS A UNIQUE FABRICATION PROCESS CAPABLE OF PRODUCING SHAPES FREE FROM SURFACE CONTAMINATION WITH SURFACE FINISHES EQUAL TO COLD FORGING AT REDUCED COSTS.

(7143) TITLE - MFG OF SPRAY ABRADABLE GAS-PATH SEAL SYSTEM

280 455

PROBLEM - METALLIC SYSTEMS CURRENTLY USED IN HIGH PRESSURE TURBINE SEALS DEGRADE DUE TO EROSION, CORROSION, AND ADVERSE RUB BEHAVIOR RESULTING IN INCREASED CLEARANCES OVER THE TURBINE BLADE TIPS AND LOSS OF ENGINE PERFORMANCE.

SOLUTION - EXTENSIVE R+D WORK HAS BEEN PERFORMED UNDER NASA, ARMY, + NAVY CONTRACTS, AND IR+D TO DEVELOP VARIOUS CERAMIC SEAL MATERIAL SYSTEMS. MANUFACTURING PROCESS PARAMETERS WILL BE ESTABLISHED FOR PLASMA-SPRAYED ZIRCONIUM OXIDE SEAL COMPONENTS.

(7285) TITLE - CAST TITANIUM IMPELLER FOR TURBINE ENGINE

705 100 350

PROBLEM - CURRENT CENTRIFUGAL COMPRESSOR IMPELLERS ARE FABRICATED BY MACHINING THE FLOWPATH AND BLADE SURFACES FROM A FORGING. THIS RESULTS IN A SUBSTANTIAL LOSS OF MATERIAL AND EXPENSIVE MACHINING OPERATIONS.

SOLUTION - ESTABLISH THE FABRICATION OF TITANIUM COMPRESSOR IMPELLERS BY CASTING AND HOT-ISOSTATIC PRESSING (HIP). THIS METHOD WILL REDUCE FABRICATION COSTS BY 40 PERCENT. IR+D CONDUCTED BY GAS TURBINE ENGINE MANUFACTURERS HAS DEMONSTRATED FEASIBILITY.

(7291) TITLE - TITANIUM POWDER METAL COMPRESSOR IMPELLER

330 240 275

PROBLEM - WHEN COMPLEX CONFIGURATIONS, SUCH AS CENTRIFUGAL IMPELLERS AND COMPRESSOR ROTORS ARE UTILIZED IN GAS TURBINE ENGINES, TYPICALLY HIGH MANUFACTURING COST ARE ENCOUNTERED.

SOLUTION - DEVELOP OVERALL PROCESS CONTROLS CAPABLE OF REPRODUCIBLY PRODUCING 100 % DENSE PARTS WITH TENSILE, AND FATIGUE STRENGTHS EQUAL TO THOSE OF HIGH QUALITY TITANIUM FORGINGS.

(7415) TITLE - RECOVERING DAMAGED T700 COMPRESSOR BLISKS

300 250 450 200

PROBLEM - BLISKS (INTEGRAL BLADES AND DISKS) ARE USED IN THE T700 ENGINE COMPRESSOR STAGES 1 THRU 5. DAMAGE TO ANY ONE BLADE DURING MANUFACTURING OR IN THE FIELD RESULTS IN SCRAPPING THE WHOLE BLISK.

SOLUTION - USE OF PRESSURE BONDING TO REPLACE DAMAGED AIRFOILS PROVIDES PROPERTIES EQUAL TO THE PARENT METAL. HIGH FREQUENCY INDUCTION HEATING WITH SIMULTANEOUS APPLICATION OF PRESSURE HAS BEEN DEMONSTRATED TO BE FEASIBLE FOR BLISK APPLICATION.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL
(7002) TITLE - MFG TECHNOLOGY FOR HI-PERFORMANCE ENGINES AND COMPONENTS 2600

PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR FAILURES IN PRODUCTION BUY ITEMS.

SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE EXISTING OR ANTICIPATED HI-PERFORMANCE ENGINE AND ASSOCIATED COMPONENTS USING CURRENT OR NEW MATERIALS.

(7200) TITLE - COMPOSITE ENGINE PARTICLE SEPARATOR 501 350

PROBLEM - CURRENTLY, FABRICATION OF THE 1700 INLET PARTICLE SEPARATOR (IPS) INVOLVES MACHINING OF CASTINGS AND FORGINGS AND THE JOINING OF THESE PARTS BY WELDING AND BRAZING. THIS IS COSTLY IN TERMS OF BOTH MATERIAL AND LABOR.

SOLUTION - ESTABLISH A NEW PROCESS TO FABRICATE THE IPS FROM INJECTION MOLDED THERMOPLASTIC COMPOSITE, COMBINED WITH HIGH MODULUS, HIGH STRENGTH THERMOSETTING COMPOSITE (GRAPHITE-POLYIMIDE). THIS WILL PROVIDE WEIGHT AND MONETARY SAVINGS.

(7248) TITLE - CLOSED LOOP MACHINING, MID-FRAME 540 420

PROBLEM - THE ENGINE MID-FRAME HAS 22 DIAMETERS WITH TOLERANCES RANGING FROM .001 IN. THESE TOLERANCES RESULT IN HIGH MACHINING, REWORK AND INSPECTION COSTS.

SOLUTION - DEVELOP CLOSED LOOP MACHINING THAT WILL AUTOMATICALLY COMPENSATE FOR ANY DEVIATION IN NUMERICAL CONTROLLED PROGRAMMED PLAN THEREBY REDUCING PRODUCTION COSTS.

(8191) TITLE - MMT-DIAGNOSTIC REVIEW OF OLD CURRENT MFG OPERATION 800 550

PROBLEM - BOTH OLD MANAGEMENT AND THE ARMY HAVE EXPRESSED CONCERN REGARDING THE CURRENT STATE OF MANUFACTURING CAPABILITY AND HAVE RECOGNIZED THE NEED FOR UPGRADING THE SAEP TO AN UP-TO-DATE LEVEL OF MFG TECH.

SOLUTION - A GROUP TECHNOLOGY EFFORT TO DEVELOP A COURSE OF ACTION FOR OBTAINING AN OPTIMUM MANUFACTURING OPERATION FOR TURBINE ENGINES.

(8192) TITLE - TURBINE ENGINE PRODUCTIVITY IMPROVEMENT 100

PROBLEM - THE STRATFORD ARMY ENGINE PLANT (SAEP) IS IN NEED OF MODERNIZATION. BOTH THE PLANT AND NEARLY 50 PERCENT OF THE EQUIPMENT IS OVER 25 YEARS OLD. A COMBINATION OF AGING MFG FACILITIES, METHODS, PROCESSES, ETC., HAVE RESULTED IN EXCESSIVE MFG COSTS.

SOLUTION - THE THRUST OF THIS PROJECT IS TO ANALYZE THE ENTIRE SAEP FACILITY WITH A FOCUS ON PRODUCTIVITY, COST SAVINGS AND PLANT MODERNIZATION. AREAS TO BE EVALUATED INCLUDE BOTH MGT AND BUSINESS SYSTEMS EG. MFG METHODS, PROCESSES, EQUIP, FACILITIES, AND CAM

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- SEALS

(7410) TITLE - SMALL ENGINE TURBINE SEAL OPTIMIZATION

PROBLEM - EFFICIENCIES OF SMALL GAS TURBINES ARE EXTREMELY SENSITIVE TO OPERATING CLEARANCES BETWEEN COMPRESSOR AND BLADE TIPS AND THE STATIONARY SEAL COMPONENTS.

SOLUTION - THIS PROJECT WILL DEVELOP THE TECHNOLOGY FOR UTILIZING A DUAL DENSITY PLASMA-SPRAYED CERAMIC SEAL. THE CHEMISTRY OF THE COATING WILL BE OPTIMIZED ALONG WITH THE POWDER MANUFACTURING PROCESS.

COMPONENT -- TURBINE BLADES

(7356) TITLE - COATINGS FOR UPGRADING PERF. OF GAS TURBINE ALLOYS

PROBLEM - THERMAL EXPANSION COEFFICIENT MISMATCH BETWEEN THE BOND AND CERAMIC LAYER RESULTS IN THERMAL STRESS CRACKING WITH SUBSEQUENT SPALLING WITHIN THE CERAMIC OVERLAY. R&D BY PRIVATE INDUSTRY HAS SHOWN THE FEASIBILITY OF THERMAL BARRIER CERAMIC OVERLAYS.

SOLUTION - ESTABLISH MANUFACTURING TECHNOLOGY FOR PRODUCING IMPROVED COATINGS ON NICKEL BASED SUPERALLOYS. PLASMA SPRAYED TECHNIQUES WILL BE UTILIZED TO OPTIMIZE A NI-CR-AL-Y CERAMIC THERMAL BARRIER OVERLAY BY ADDING AN INTERMEDIATE LAYER ON THE BLADES.

(7371) TITLE - INTEGRATED BLADE INSPECTION SYSTEM (IBIS)

PROBLEM - INSPECTION OF TURBINE ENGINE BLADES AND VANES NECESSITATES HIGH ACCURACY. THE EFFORT IS TIME CONSUMING AND SUSCEPTABLE TO ERROR.

SOLUTION - THIS PROJECT WILL IMPROVE THE INFRARED, X-RAY, AND INFRARED THERMOGRAPHY INSPECTION MODULES BY INCREASING RELIABILITY, REPEATABILITY AND SENSITIVITY. ALSO, INSPECTION COSTS WILL BE REDUCED.

(7416) TITLE - ADVANCED TURBINE AIRFOIL CASTINGS

PROBLEM - TURBINE AIRFOLLS ARE DESIGNED TO A STRESS RUPTURE LIMIT WHETHER COOLED OR UNCOOLED. THIS LIMIT IS LOW DUE TO EQUIAXED CAST SUPERALLOY MATERIALS CURRENTLY USED AND THEIR INHERENT GRAIN BOUNDARY LIMITATIONS.

SOLUTION - ADVANCED CASTING TECHNIQUES PERMITTING DIRECTIONALLY-ALIGNED GRAIN GROWTH ELIMINATE THE GRAIN BOUNDRIES PERPENDICULAR TO THE STRESSED DIRECTION WHICH INCREASES THE LONGITUDE STRENGTH, CREEP RESISTANCE, AND RUPTURE LIMITS.

(8190) TITLE - IMPROVED CUTTER LIFE, T-700 COMP BLISK/IMPELLER MILLING OPER

PROBLEM - MILLING CUTTER COST ASSOCIATED WITH THE BLISK AND IMPELLER FOR THE T-700 ENGINE IS AVERAGING \$2540 PER ENGINE AND IS CONSIDERED EXCESSIVELY HIGH.

SOLUTION - INVESTIGATE CUTTER PARAMETERS WHICH AFFECT CUTTER LIFE, SUCH AS FEEDS, SPEEDS, GEOMETRY, AND CUTTING FLUIDS AND THEREBY DEVELOP A MANUFACTURING TECHNOLOGY TO REDUCE CUTTER COSTS BY 50 PERCENT.

115 125

313 357 710 320

300 450

225 486

200

250

330

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- TURBINE DISKS

(7361) TITLE - COMPUTER AIDED HIP OF ENGINE DISKS

PROBLEM - MOST ENGINE DISKS ARE PRODUCED FROM TITANIUM AND SUPERALLOYS BY FORGING AND MACHINING AT CONSIDERABLE COST. HOT ISOSTATIC PRESSING (HIP) IS AN APPLICABLE NEAR NET SHAPE PROCESS BUT IT REQUIRES EXPENSIVE TRIAL AND ERROR RUNS FOR THE PREFORMS.

SOLUTION - A COMPUTER-AIDED DESIGN TECHNIQUE WILL BE DEVELOPED FOR ACCURATE DESIGN OF HIP PREFORMS. THIS TECHNIQUE WILL SIMULATE THE SIMULTANEOUS DENSIFICATION AND HEAT TRANSFER DURING A HIP CYCLE. RECENT WORK HAS SHOWN THE FEASIBILITY OF THIS APPROACH.

325 300

(7417) TITLE - LOW COST DISKS BY CAP

PROBLEM - POWDER METAL DISKS FORM A SIGNIFICANT PART OF THE ENGINE COST DUE TO EXPENSIVE TOOLING/DIE REQUIREMENTS AND HIGH PRESSURE CONSOLIDATION EXPENSE.

SOLUTION - RECENT DEVELOPMENTS IN CONSOLIDATION BY ATMOSPHERIC PRESSURE HAS SHOWN THAT SUPERALLOY POWDERS CAN BE CONSOLIDATED TO 98 PERCENT DENSITY AT A REDUCED COST. LOWER COST GLASS DIES CAN ALSO BE USED WHICH REDUCES THE COST FURTHER.

300 350

COMPONENT -- TURBINE ROTORS

(7191) TITLE - COST EFFECTIVE PRODUCTION OF COOLED TURBINE ROTORS

PROBLEM - PRODUCTION PROCESSES AND QUALITY CONTROL PROCEDURES DO NOT CURRENTLY EXIST FOR AIR-COOLED TURBINE ROTORS.

SOLUTION - DEVELOP A COST EFFECTIVE PROCEDURE FOR PRODUCING AND ASSURING THE QUALITY OF SINGLE AIR-COOLED ROTORS WHICH CAN DO THE WORK OF TWO STAGES UNDER PRESENT TECHNOLOGY.

440

(7197) TITLE - FABRICATION OF INTEGRAL ROTORS BY JOINING

PROBLEM - CURRENT GAS TURBINE ROTORS ARE EITHER INTEGRALLY CAST OR THE BLADES AND DISKS ARE SEPARATE UNITS. THE BLISK CONCEPT DOES NOT PERMIT OPTIMUM MECHANICAL PROPERTIES OF THE UNIT AND THE OTHER METHOD REQUIRES COMPLEX AND EXPENSIVE MACHINING.

SOLUTION - A BONDED BLADE AND DISK IS FEASIBLE AND WILL REDUCE THE MAJOR MACHINING REQUIREMENTS, STRESS CONCENTRATIONS, AND SIZE AND WEIGHT CONSTRAINTS ON THE DESIGN. THIS ALSO ALLOWS MATERIAL SELECTION TO BE BASED ON PERFORMANCE RATHER THAN JOINING CAPACITY.

500 190 217

		FUNDING (\$000)				
		PRIOR	81	82	83	84 85
COMPONENT -- TURBINE ROTORS		-----				
(7300) TITLE - IMPROVED LOW CYCLE FATIGUE CAST ROTORS			60	500	300	
<p>PROBLEM - INTEGRALLY CAST TURBINE ENGINE ROTORS HAVE BEEN SHOWN TO BE COST EFFECTIVE. HOWEVER, INVESTMENT CASTING RESULTS IN LARGE GRAIN SIZES IN THE DISK REGION AND THIS REDUCES FATIGUE LIFE COMPARED TO WROUGHT MATERIAL.</p> <p>SOLUTION - DEFINE CASTING AND HEAT TREAT PARAMETERS, AND FINALIZE THE MANUFACTURING TECHNOLOGY FOR ESTABLISHING FINE-GRAINED CAST ROTOR PRODUCTION UTILIZING GRAIN-REFINEMENT TECHNIQUES.</p>						
(7351) TITLE - COMPOSITE SHAFTING FOR TURBINE ENGINES			300	325		
<p>PROBLEM - CURRENT MATERIAL CAPABILITIES ASSOCIATED WITH HIGH SPEED GAS TURBINE ENGINE SHAFTING REQUIRE EXCESS BEARINGS AND CAREFUL DESIGN REGARDING SHAFT DYNAMICS.</p> <p>SOLUTION - RECENT DEVELOPMENTS IN FABRICATING METAL MATRIX COMPOSITE SHAFTING OFFER INCREASED STIFFNESS AND CRITICAL SPEEDS BY 30-40 PERCENT AND CAN REDUCE THE DIAMETER.</p>						
(7401) TITLE - CAST IMPELLER AND CLEAN CASTING				685	525	450
<p>PROBLEM - INVESTMENT CAST METAL HAS NUMEROUS SOURCES OF NON-METALLIC CONTAMINATION DURING CONVENTIONAL PROCESSING. THE RESULTING INCLUSIONS REDUCE CASTING PROPERTIES OR INCREASE CASTING COST BY REQUIRING WELD REPAIR.</p> <p>SOLUTION - THIS PROJECT WILL SEEK TO IDENTIFY AND ELIMINATE THE MAJOR CAUSES OF NON-METALLIC INCLUSIONS IN CASTINGS. THE FINDINGS WILL BE APPLIED TO THE CASTING OF HIGH STRENGTH INCO 718 IMPELLERS AND OTHER CRITICAL COMPONENTS</p>						
(7402) TITLE - CAST INTEGRAL LOW PRESS TURBINE ROTOR					650	1120
<p>PROBLEM - THE CURRENT PRACTICE FOR MFG T700 TURBINES IS TO ATTACH CAST TURBINE BLADES TO A FORGED DISK. EXTENSIVE MACHINING OF THE AIRFOIL AND DISK DOVETAIL JOINTS IS REQ'D.</p> <p>SOLUTION - DEVELOP THE PROCESS FOR INTERGRALLY CAST BLISKS AND PERFORM ENDURANCE TESTING.</p>						
(7409) TITLE - IMPROVED CAST TURBINE ROTOR						330
<p>PROBLEM - DIFFICULTIES HAVE BEEN ENCOUNTERED IN CASTING IN792 FOR POWER TURBINE ROTORS AS THE ROTORS ARE SHROUDED AND CONTAIN RELATIVELY LONG SLENDER AIRFOILS ATTACHED TO LARGE HIPS DESPITE THE UTILIZATION OF HIP TECHNIQUES.</p> <p>SOLUTION - SELECTED ALLOYS AND PROCESSES WILL BE EVALUATED IN A FULL SCALE ROTOR CONFIGURATION USING IN 752 AS A BASELINE.</p>						

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

	81	82	83	84	85
PRIOR					

COMPONENT -- TURBINE ROTORS

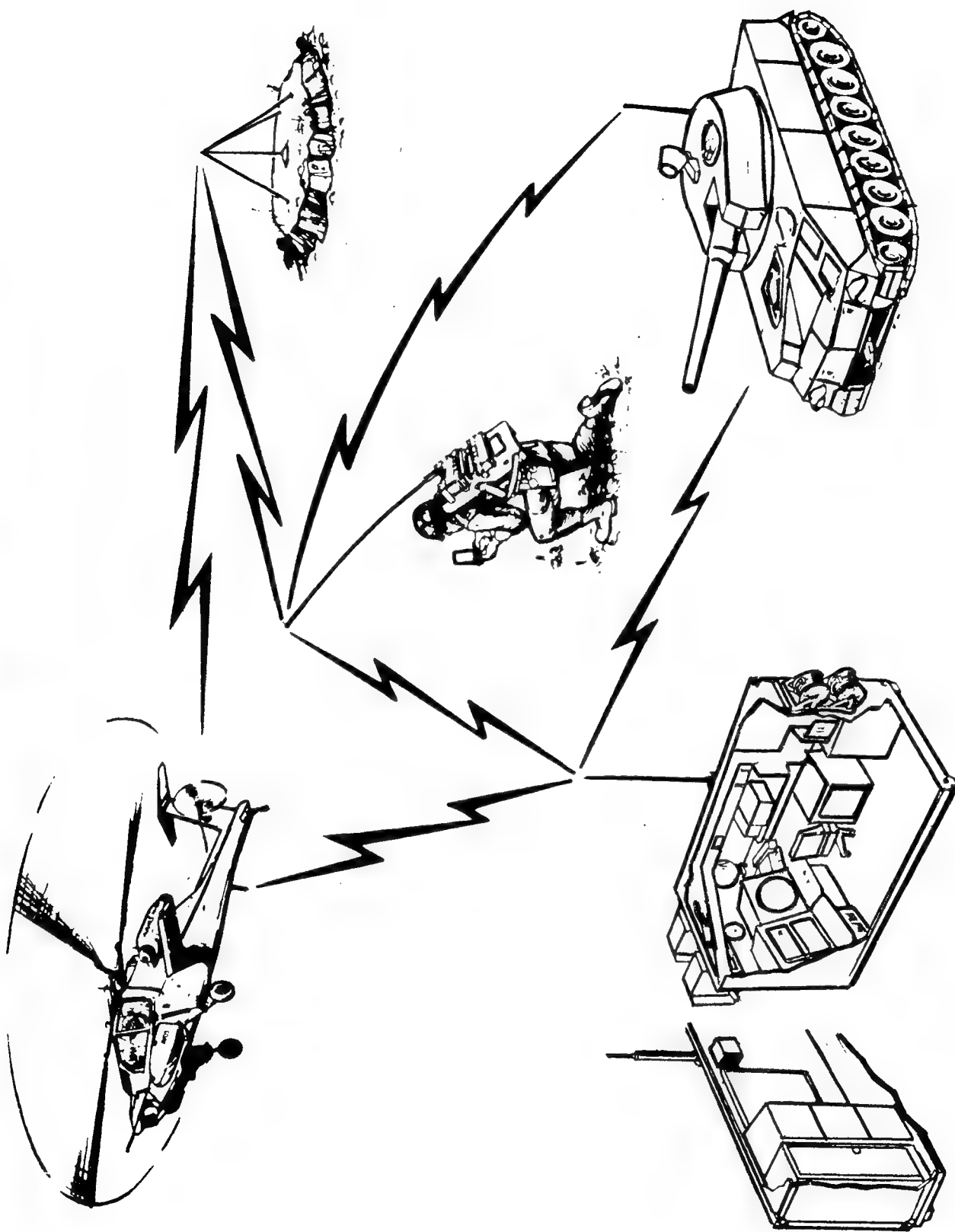
(CONTINUED)

(7411) TITLE - SECOND GENERATION DUAL PROPERTY TURBINE ROTORS

PROBLEM - SECOND GENERATION TURBINE DESIGNS COULD BECOME SIGNIFICANTLY MORE ATTRACTIVE IN COST AND PERFORMANCE BY IMPLEMENTATION OF ADVANCED MATERIALS AND DESIGN CONCEPTS.

SOLUTION - FABRICATE SECOND GENERATION DISKS BY THE LOWER COST CAP (CONSOLIDATION BY ATMOSPHERIC PRESSURE) TECHNIQUE. MANUFACTURE IMPINGEMENT TUBES BY CASTING THEM AS AN INTEGRAL COMPONENT.

	330	350	400
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COMMUNICATIONS & ELECTRONICS COMMAND (CECOM)

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US ARMY COMMUNICATIONS AND ELECTRONICS COMMAND
(CECOM)

The US Army Communications and Electronics Command (CECOM), headquartered at Ft. Monmouth, NJ, is responsible for research, development, production, and fielding of communications, tactical data, and command and control systems for the Army. CECOM consists of laboratory and technical support segments and Project Managers of Multi-Service Communications System (MSCS), Army Tactical Communications System (ATACS), and project managed elements of Army Tactical Data Systems (ARTADS), i.e., Tactical Fire Control System (TACFIRE), Missile Minder (AN/TSQ-37), Tactical Operations System (TOS), and Position Location Reporting System (PLRS).

CECOM's planned projects cover a variety of electronics problems with special emphasis on computer applications and circuit technology. Projects support efficient manufacturing of custom components for use in future tactical radios.

Video disc information storage is a possible technology for an electronic system for the dissemination of training, technical, and doctrinal data. A project will investigate methods to reduce the cost of mastering and duplicating the discs.

Several projects will obtain the necessary manufacturing technology for the precision crystals and temperature compensated resonators needed to meet the frequency stability requirements of Army tactical radios.

Program funding in the out-years largely anticipates micro-electronics as the driving force in componentry and built-in test capability for command, control, and communications systems. Computer-dominated methodologies are inherent in such areas as design, manufacture, and manufacturing documentation for communications systems and are expected to be of particular value for the short lead time, low volume production anticipated for future equipment and systems.

CECOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
DETECTORS	670	0	612	0	0
DISPLAYS	777	950	0	0	0
FREQUENCY CONTROL	1829	827	1200	425	0
GENERAL	125	120	3000	1900	1000
INTEGRATED ELECTRONICS	880	495	1000	2400	0
OPTICS	0	0	0	225	0
SOLID STATE	0	500	0	0	0
	----	----	----	----	----
TOTAL	4281	2892	5812	4950	1000

 * C A T E G O R Y *

 *DETECTORS *

MMT FIVE YEAR PLAN
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- PHOTO/OPTICAL

(3050) TITLE - III-V SEMICONDUCTOR PHOTODETECTORS

670 612

PROBLEM - INTRINSIC AND INDUCED LOSSES LIMIT RANGE OF FIBER OPTIC TRANSMISSION. PRODUCTION MEANS WILL BE NEEDED FOR PHOTODETECTOR CAPABLE OF OPERATION IN SPECTRAL REGION INTRINSICALLY LESS SUSCEPTIBLE TO SUCH LOSSES.

SOLUTION - THIS PROJECT WILL ESTABLISH PRODUCTION TECHNIQUES FOR FORMATION OF A QUATERNARY III-V SEMICONDUCTOR PHOTOIODE WITH GUARD RING, SEMIAUTOMATIC ATTACHMENT AND MOUNTING AND AUTOMATIC TESTING OF THE ASSEMBLY.

 * C A T E G O R Y *

 *DISPLAYS *

COMPONENT -- MISCELLANEOUS

(3056) TITLE - ELECTROLUMINESCENT NUMERIC MODULE

777

PROBLEM - HIGH CONTRAST NUMERIC READOUTS ARE REQUIRED FOR SUNLIGHT LEGIBILITY AND FULL ENVIRONMENTAL OPERATION IN TACTICAL EQUIP. ELECTROLUMINESCENT MODULES NEEDED TO FULFILL THIS REQUIREMENT ARE AVAILABLE ONLY AS SMALL QTY, HIGH COST, LAB BUILT SAMPLES.

SOLUTION - THIN FILM CIRCUITRY TECHNIQUES AND HYBRID ASSEMBLY PROCEDURES WILL BE USED TO ACHIEVE AN EFFICIENT HIGH YIELD MFG TECHNOLOGY CAPABLE OF PRODUCING RELIABLE FULLY MILITARIZED NUMERIC DISPLAY DEVICES AT REASONABLE COST FOR LARGE VOLUME USAGE.

(3073) TITLE - TACTICAL GRAPHICS DISPLAY PANEL

950

PROBLEM - FAB OF ELECTROLUMINESCENT DISPLAY PANELS REQUIRES REPRODUCIBLE DISPOSITIONS OF ELECTROLUMINESCENT PHOSPOR DIELECTRIC LAYER AND TRANSPARENT CONDUCTORS. INTERCONNECTION OF INTEGRATED DRIVER AND SHIFT REGISTER CIRCUITS IS NECESSARY.

SOLUTION - UNIFORM REPEATABLE THIN FILM DEPOSITIONS WILL BE ESTABLISHED OVER SUBSTRATE SIZES UP TO 12 INCH DIAGONAL MEASURE. COST WILL BE REDUCED BY OPTIMUM CLEANING, HANDLING, AND PRODUCTION SEALING TECHNIQUES.

 * C A T E G O R Y *

 *FREQUENCY CONTROL *

COMPONENT -- CRYSTALS

(3047) TITLE - LOW COST HIGH STABILITY QUARTZ RESONATORS

600

PROBLEM - SINCGARS FREQUENCY STABILITY REQUIREMENTS CANNOT BE MET WITH PRESENTLY AVAILABLE MASS PRODUCED CRYSTALS. HAND PICKED, LOW YIELD CRYSTALS ARE REQUIRED AND PRODUCTION PROBLEMS WILL ARISE DUE TO A SHORTAGE OF PRECISION CRYSTALS.

SOLUTION - ACHIEVE THE TECHNOLOGY NECESSARY TO PRODUCE LARGE QUANTITIES OF HIGH STABILITY, LOW COST CRYSTALS.

(3057) TITLE - HIGH STABILITY VIBRATION RESISTANT QUARTZ CRYSTALS

1057

PROBLEM - CURRENT CRYSTAL RESONATORS SHOW FREQUENCY CHANGES WITH ACCELERATION. THIS IS A SERIOUS PROBLEM WHERE THE RESONATOR MUST OPERATE IN A VIBRATORY ENVIRONMENT. CONSEQUENCES ARE ESPECIALLY SEVERE WHEN EQUIPMENT MUST OPERATE IN A JAMMING ENVIRONMENT.

SOLUTION - DOUBLY ROTATED QUARTZ CRYSTAL RESONATORS, PARTICULARLY THE SC-CUT, HAVE A MUCH LOWER SENSITIVITY TO MECHANICAL STRESS THAN THE COMMONLY USED (SINGLY ROTATED) AT-CUT. BASED ON R+D AND OTHER INFORMATION PRODUCTION TECHNIQUES WILL BE DEVELOPED.

(9851) TITLE - TACTICAL MINIATURE CRYSTAL OSCILLATORS

772

PROBLEM - STATE-OF-THE-ART PRECISION QUARTZ OSCILLATORS DO NOT MEET THE PERFORMANCE, PRODUCIBILITY, AND COST CRITERIA NEEDED FOR PLANNED EQUIPMENT. TACTICAL MINIATURE CRYSTAL OSCILLATOR (TMXO) IS HIGH PERFORMANCE BUT REQUIRES NEW PRODUCTION TECHNIQUES.

SOLUTION - ESTABLISH QUALITY CONTROL PROCEDURES AND COST EFFECTIVE PROCESSES FOR ASSEMBLY, OUTGASSING, SEALING, AND TESTING PRODUCTION TMXO. ALSO, DESIGN AND FABRICATE SPECIAL FIXTURING AND TOOLING FOR IMPLEMENTING MANUFACTURING PROCESSES UNIQUE TO TMXO.

COMPONENT -- OSCILLATORS

(3048) TITLE - MICROPROCESSOR COMPENSATED CRYSTAL OSCILLATOR

827

PROBLEM - LOW POWER TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS WITH STABILITY (1-5X10E-7) SUITABLE FOR USE IN JAM PROOF ARMY RADIOS (SINCGARS) ARE NOT AVAILABLE IN PRODUCTION QUANTITIES.

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR COST EFFECTIVE, LONG LIFE, STABLE TCXO'S WHICH UTILIZE MICROPROCESSOR FOR TEMPERATURE COMPENSATION FUNCTION.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- OSCILLATORS

(CONTINUED)

(3083) TITLE - 36-40 AND 54-58 GHZ GUNW OSCILLATOR PRODUCTION PROCESS

600 425

PROBLEM - TECHNIQUES FOR EFFICIENT MANUFACTURE OF DEVICES TO BE USED IN
FUTURE ARMY MULTICHANNEL RADIO SYSTEMS REQUIRE GOVERNMENT INVESTMENT TO
ASSURE THEIR AVAILABILITY

SOLUTION - ACHIEVE SUCH MANUFACTURING TECHNOLOGY THROUGH GOVERNMENT FUNDED
MANTECH EFFORT

* C A T E G O R Y *

*GENERAL *

COMPONENT -- MISCELLANEOUS

(3005) TITLE - GRAPHICAL PART PROGRAMMING EVALUATION

125

PROBLEM - POTENTIAL EXISTS TO EXTEND THE EXISTING COMPUTER-AIDED INTERACTIVE
DESIGN SYSTEMS FOR THE CREATION OF NUMERICAL CONTROL TAPES AND
THREE-DIMENSIONAL PARTS GEOMETRIES TO A BROAD RANGE OF DOD EQUIPMENT
REQUIREMENTS.

SOLUTION - THIS PROJECT WILL EVALUATE THE CAPABILITY OF EXISTING COMPUTER
AIDED INTERACTIVE DESIGN SYSTEMS TO PRODUCE NUMERICAL CONTROL PART PROGRAMS
AND PART GEOMETRIES FOR DOD PRODUCTION REQUIREMENTS.

(3041) TITLE - TOOL FOR PRODUCTION OF SPA DOCUMENTATION

900 200 100

PROBLEM - CONVERSION OF EXISTING MAINTENANCE AND TRAINING DOCUMENTATION TO
INTERACTIVE ELECTRONIC DISPLAY FORMAT REQUIRES HIGH DEGREE OF AUTOMATION TO
BE PRACTICAL

SOLUTION - ACHIEVE WORKABLE SOFTWARE, DEFINE AND ACQUIRE HARDWARE

(3042) TITLE - MASTERING AND DUPLICATION OF VIDEO DISCS

450

PROBLEM - THE HIGH COST OF MASTERING AND DUPLICATING OF VIDEO DISCS HAS
RESTRICTED THE USE OF THE TECHNOLOGY IN HIGH PAYOFF TRAINING AND MAINTENANCE
OPERATIONS.

SOLUTION - THIS PROJECT WILL PROVIDE METHODS AND TECHNIQUES FOR LOW-COST
MASTERING AND DUPLICATION OF VIDEO DISCS.

(3059) TITLE - INTELLIGENT TERMINALS & PERIPHERALS FOR MILITARY COMPUTERS

1700

PROBLEM - THERE IS A NEED TO ESTABLISH A PRODUCTION CAPABILITY TO MANUFACTURE
TO FORM, FIT, AND FUNCTION INTELLIGENT TERMINALS AND PERIPHERALS FOR THE
MILITARY COMPUTER FAMILY.

SOLUTION - OBTAINING THIS CAPABILITY WILL PERMIT THE FABRICATION OF COST
EFFECTIVE TERMINALS AND PERIPHERALS WITH IMPROVED FLEXIBILITY,
INTEROPERABILITY, SURVIVABILITY AND REDUCED ACQUISITION TIME.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(3069) TITLE - FUNCTIONAL SEGMENTATION OF AUTO TEST EQUIP

120 750

PROBLEM - ARMY ELECTRONIC ITEMS MUST BE TESTED ON EXPENSIVE AUTOMATIC TESTERS THAT CONTAIN MORE CAPABILITY THAN NEEDED AND COST MORE THAN MOST FIRMS CAN AFFORD.

SOLUTION - RECONFIGURE THE AN/USM-410 EQUATE TESTER TO PERMIT A MINIMUM OF MODULES TO DO SOME LOW ORDER TESTING AND PERMIT ADD-ONS TO BE ADDED TO UPGRADE THE GEAR TO HANDLE ADDITIONAL TESTS AS NEEDED. WORK ON SOFTWARE COMPATIBILITY.

(3076) TITLE - ANALOG CIRCUIT TEST PROGRAM AUTOMATIZED PREPARATION-III

450 450

PROBLEM - PRESENT HIGH COST OF TEST PROGRAM PREPARATION

SOLUTION - REDUCE SUCH COSTS BY EXTENDING PREVIOUS WORK DONE TO ADDITIONAL CIRCUIT TYPES AND SOME COMPOSITE CIRCUITS

(3077) TITLE - EXISTING TEST PROGRAM USAGE ON STANDARD ATE

450 450

PROBLEM - PRESENT PROCEDURE FOR ATE SOFTWARE RESULTS IN TEST EQUIPMENT SPECIFIC PROGRAMS

SOLUTION - CREATE AN INTERVAL ROUTINE THAT WILL PERMIT EXISTING TEST PROGRAMS TO BE UTILIZED BY STANDARD ATE SYSTEMS.

* C A T E G O R Y *

*INTEGRATED ELECTRONICS *

COMPONENT -- AMPLIFIERS

(9835) TITLE - INTEGRATED CONTROL CIRCUIT FOR THIN FILM TRANSISTOR DISPLAY

1049 620 495

PROBLEM - SEMICONDUCTOR DISPLAY ARRAYS REQUIRE COMPACT YET COMPLEX DRIVE CIRCUITS. A MULTI-STAGE VACUUM METALLIZING SYSTEM IS NEEDED.

SOLUTION - DEVELOP MASK MOUNTING AND CHANGING TECHNIQUES. DEVELOP METHODS FOR CLEANING AND REINSERTING MASKS WITHOUT CHANGING REGISTRATION. PUT PERIPHERAL CIRCUITS ON DISPLAY PANEL.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- CIRCUITRY

(3036) TITLE - SPECIAL COMPONENTS MFG TECHNIQUES FOR SINGLE CHANNEL RADIOS

20 260 1000 1000

PROBLEM - SEMICONDUCTOR INTEGRATED CIRCUITS NEEDED FOR SPECIAL COMMUNICATIONS EQUIP. MUST BE CUSTOM DESIGNED FOR EACH NEW APPLICATION. EACH IC REQUIRES SEVERAL MASK SETS AND A NUMBER OF IC ARE REQUIRED FOR EACH DEVICE. CONSIDERABLE ARTWORK IS REQUIRED.

SOLUTION - DEVELOP COMPUTER AIDED MANUFACTURING TECHNIQUES THAT WILL REDUCE THE COST OF AND IMPROVE THE RELIABILITY OF SEMICONDUCTOR INTEGRATED CIRCUITS

(3058) TITLE - VHSL & LSI CHIP SETS FOR MILITARY COMPUTER FAMILY MODULES

1400

PROBLEM - THERE IS A NEED FOR CONTINUING DEVELOPMENT OF INTEGRATED CIRCUIT TECHNOLOGY IN THE AREA OF LSI AND VHSL TO PROVIDE CHIP SETS OF MILITARY COMPUTER FAMILY BOXES AND MODULES TO REDUCE SIZE AND COST OF MCF SYSTEMS.

SOLUTION - THE DEVELOPMENT OF LSI AND VHSL CHIP SETS WILL PERMIT MAJOR REDUCTIONS IN MCF SYSTEM SIZE FROM 5-7 BOXES TODAY, DOWN TO ONE BOX IN THE 1990'S. IT WILL ALSO MEAN SIGNIFICANT REDUCTION IN COSTS AND PROVISION OF COMMON BUS INTERFACING.

* C A T E G O R Y *

OPTICS

COMPONENT -- FIBER

(3061) TITLE - IMPROVED GLASS PROCESSES FOR OPTICAL FIBERS

225

PROBLEM - GLASS FIBER IMPURITY CONTENT CONTRIBUTES TO TRANSMISSION LOSS, PREFORM PROCESS LIMITS FIBER LENGTH

SOLUTION - ADAPT TECHNIQUES NOW IN EXPERIMENTAL STAGE WHICH SHOW POTENTIAL FOR SOLVING THE PROBLEM.

* C A T E G O R Y *

SOLID STATE

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

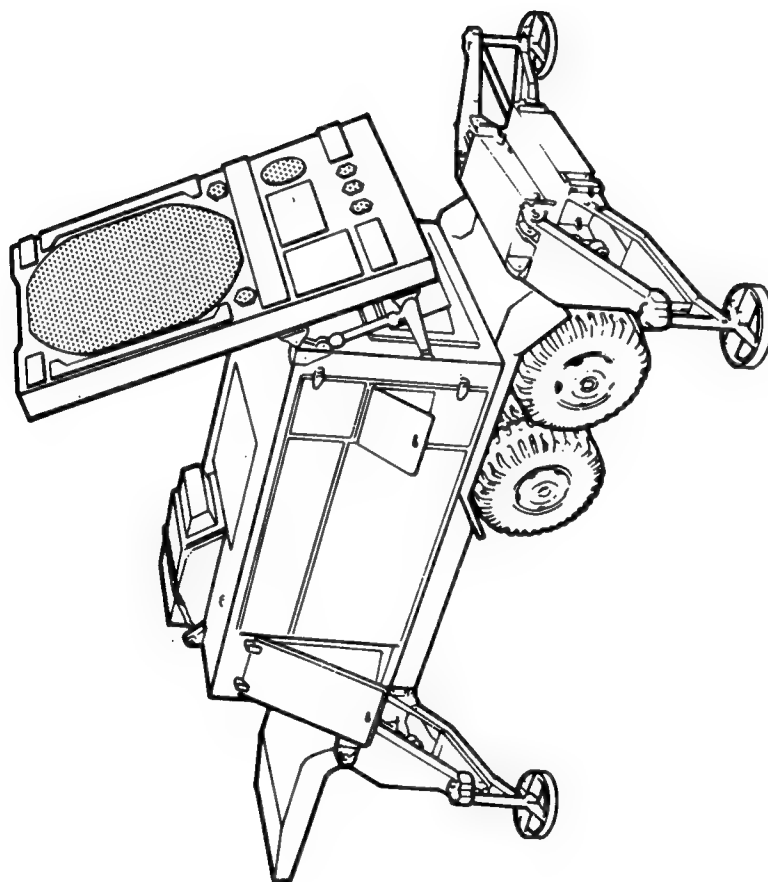
COMPONENT -- DIODES/RECTIFIERS

(3068) TITLE - INCREASE PROD OF SEMICONDUCTOR CONTROL DIODES

500

PROBLEM - PRESENTLY AVAILABLE VARACTORS AND PIN DIODES MADE BY SILICON DIODE TECHNOLOGY ARE EXPENSIVE. THE IR PRODUCTION TECHNIQUES ARE VERY LABOR INTENSIVE, YIELDS ARE LOW, AND UNIFORMITY IS POOR. MATCHING REQUIRES EXTENSIVE TESTING.

SOLUTION - USE GALLIUM ARSENIDE FOR THESE DEVICES. USE AUTOMATIC CONTROL SYSTEM FOR PROCESSES INSTEAD OF MANUAL PROCEDURES TO INCREASE YIELD. DEPOSIT A MEDIUM TEMPERATURE PASSIVATION LAYER ON PIN DIODES TO IMPROVE RELIABILITY AND UNIFORMITY.



**ELECTRONICS R&D COMMAND
(ERADCOM)**

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US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND

(ERADCOM)

ERADCOM is the Army's focal point for electronics research, development and acquisition (RDA) activities, and maintains programs in such areas as electronics signal intelligence, electronic warfare, atmospheric sciences, target acquisitions and combat surveillance, electronic fuzing, radars, sensors, night vision, radar frequency and optical devices, nuclear weapons effects, instrumentation and simulation, and fluidics.

Seven laboratories are integrated into ERADCOM's structure. These laboratories are product oriented and as a result can identify major problem areas where applied MMT efforts can provide important benefits. Although ERADCOM and its laboratories identify and manage projects, the bulk of the actual work is contracted out to industry.

A major area of interest is developing legible tactical displays which are suitable for military use. Because of operational limitations in legibility, power requirements, weight and RAM (reliability, availability and maintainability) characteristics conventional displays are unacceptable. New technologies for rugged flat panel displays which can satisfy these requirements are now in development but need improved manufacturing methods for effective production.

Improving sighting capabilities is an area of prime concern to all the Services. Several projects for significant improvements in production techniques for image intensifiers are included in the Plan. The development of millimeter wave and infrared laser systems for all-weather and smoke fighting is being pursued. This will require the development of new control systems and subsystems. Improved techniques will be needed to insure the quality and quantity of such systems. Projects are also included that deal with thermal optical systems. These include the present generation Common Modules and future second generation systems such as the ATAC and MISTAF FLIRS (Forward Looking Infrared Systems) and the Thermal Weapon Sight (TWS).

ERADCOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
DETECTORS	1467	0	3200	4350	5650
DISPLAYS	303	0	800	3100	850
ELECTRON TUBES	0	1308	2450	2600	0
FREQUENCY CONTROL	0	0	1000	0	2000
GENERAL	0	1179	1000	1850	0
INTEGRATED ELECTRONICS	863	1179	1650	5600	2750
LASER	523	621	2350	500	1700
OPTICS	596	0	1250	950	1050
PASSIVE COMPONENTS	0	596	0	0	0
POWER SOURCES	0	0	650	0	0
SOLID STATE	1152	2329	1200	0	500
	-----	-----	-----	-----	-----
TOTAL	4904	7212	15550	18950	14500

 * C A T E G O R Y *

 DETECTORS

MMT FIVE YEAR PLAN
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- ARRAYS

(5057) TITLE - 3-5 MICRON TE COOLED FOCAL PLANE MODULES

1000 1000

PROBLEM - IMPROVED THERMAL IMAGING EQUIPMENT OPERATING AT 3-5 MICRONS REQUIRE USE OF HIGH DENSITY MATRIX DETECTOR ARRAY IN THE ORDER OF 2000 ELEMENTS. THIS EQUIPMENT CAN'T BE PRODUCED WITH TODAY'S THERMAL IMAGING OFF-FOCAL-PLANE ARRAY TECHNOLOGY.

SOLUTION - INITIATE A PHASED PROGRAM TO ESTABLISH CONTROLLED MANUFACTURING PROCESSES AND TEST METHODS TO PRODUCE INTEGRATED FOCAL PLANE ARRAY COOLER/DEWAR MODULES TO OPERATE AT 195 K. ESTABLISH AND VALIDATE PRODUCTION AND TEST METHODS FOR COMPLETED MODULE.

(5063) TITLE - VACUUM DEWARS FOR MOSAIC ARRAYS FOR 2ND GEN. FLIR

800

PROBLEM - NEW DEWAR CONCEPTS MUST BE ESTABLISHED TO HOUSE THE NEW GENERATION FOCAL PLANE ARRAYS SUCH THAT VACUUM INTEGRITY AND MECHANICAL STABILITY ARE MAINTAINED.

SOLUTION - DEVELOP PRODUCTION TECHNIQUES FOR LOW OUT-GASSING DEWAR COMPONENTS.

(5110) TITLE - COMMON MODULE DETECTOR ARRAY

1300 753

PROBLEM - MERCURY-CADMIUM TELLURIDE DETECTOR ARRAYS ARE NOW HAND LAPPED AND POLISHED. CONTACT MASKING IS USED FOR PHOTOLITHOGRAPHY AND WET ETCHING FOR DELINEATION. ALSO, GOLD WIRING IS USED FOR LEADOUTS. THESE ARE LABOR INTENSIVE AND NON-UNIFORM.

SOLUTION - USE SEMICONDUCTOR INDUSTRY PRACTICES OF BATCH MACHINE LAPPING AND POLISHING OF HG-CD-TE WAFERS. PROJECTION PHOTOMASKING, PLASMA ETCHING, ION BEAM MILLING, LEAD-OUT METALLIZATION, AND PLATING. THESE SHOULD PROVIDE UNIFORM RESULTS.

(5125) TITLE - ROOM TEMPERATURE NMW DETECTOR ARRAYS

650

PROBLEM - EFFICIENT RADIATION COUPLING BETWEEN ANTENNAS AND DETECTORS REQUIRES EXTREME DIMENSIONAL AND INDEX OF REFRACTION TOLERANCES.

SOLUTION - DEVELOP METHODS TO DEPOSIT DIELECTRIC / THIN FILM METAL WAVEGUIDE STRUCTURES WITH PREDICTABLE AND CONTROLLABLE EFFECTIVE INDICES OF REFRACTION.

(5151) TITLE - LIQUID PHASE EPITAXIAL HgCDTE

2000

PROBLEM - LOW YIELD ON CURRENT METHOD OF MANUFACTURE OF COMMON MODULE DETECTOR ARRAYS. GROWTH OF HgCDTE CRYSTALS REQUIRES MANUAL LAPPING, POLISHING & THINNING TO ACHIEVE PERFORMANCE SPECIFICATIONS.

SOLUTION - USE LIQUID PHASE EPITAXIAL GROWTH OF THIN-FILM ON CDTE SUBSTRATE ELIMINATING MANUAL STEPS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- INFRARED/UV

(5059) TITLE - MAGNETIC SUSPENSION COOLERS

350

PROBLEM - SECOND GENERATION FLIR'S WILL EMPLOY MAGNETIC SUSPENSIONS IN THE CRYOGENIC COOLERS. MAINTAINING CRITICAL SUSPENSION TOLERANCES IN PRODUCTION WILL REQUIRE DEVELOPING EXTENSIVE QUALITY CONTROL PROCEDURES.

SOLUTION - DEVELOP MANUFACTURING METHODS FOR MAINTAINING CRITICAL TOLERANCES.

(5073) TITLE - ADVANCED MECHANICAL COOLERS FOR 2ND GEN. FLIR'S

850

PROBLEM - SECOND GEN IR SENSORS ARE NOW VERY SUSCEPTIBLE TO VIBRATIONS AND THERMAL FLUCTUATIONS TO A LARGER DEGREE THAN CONVENTIONAL FIRST GEN SYSTEMS.

SOLUTION - DEVELOP MANUFACTURING TECHNIQUES FOR REDUCING THERMAL FLUCTUATIONS AND VIBRATIONS

(5079) TITLE - 1-2 MICRON CHARGE COUPLED DEVICE

2000

PROBLEM - NEW PROJECT NO PROBLEM FURNISHED

SOLUTION - NEW PROJECT NO SOLUTION FURNISHED

(5086) TITLE - SOLID STATE PYROELECTRIC IMAGER

3000

PROBLEM - LOW YIELD OF PYROELECTRIC MATERIAL SUITABLE FOR RETINA. LOW YIELD OF INTERCONNECT FROM PYROELECTRIC MATERIAL TO THE CCD.

SOLUTION - DEVELOP METHODS FOR THE PRODUCTION OF LARGE AMOUNTS OF PYROELECTRIC MATERIAL. DEVELOP INTERCONNECT TECHNIQUES FOR THE PRODUCTION OF PYROELECTRIC RETINA.

(5177) TITLE - THERMO-ELECTRIC COOLER MATERIAL

350

PROBLEM - SUPERIOR HIGH PERF. MATERIALS REQUIRED FOR 2 GEN. FLIR TE COOLERS ARE AVAILABLE ONLY IN RESEARCH QUANTITIES & QUALITIES. TRANSITION FROM RESEARCH TO PRODUCTION WILL INTRODUCE VARIOUS DEGRADATION FACTORS.

SOLUTION - ESTABLISH PRE-PRODUCTION METHODS & TECHNIQUES FOR HIGH QUALITY CONTROL NECESSARY TO MEET SECOND GENERATION FLIR DEMANDS.

(9588) TITLE - THIRD GENERATION LOW COST COGGLE TUBE

892 714

PROBLEM - TYPICAL MANUFACTURING METHODS REQUIRE THE USE OF AN EXCESSIVE AMOUNT OF HAND LABOR WHICH CONTRIBUTES TO HIGH UNIT COSTS FOR THE INTENSIFIER TUBE.

SOLUTION - DETERMINE THE MOST ECONOMICAL METHOD FOR PRODUCING A LOW COST 3RD GENERATION IMAGE INTENSIFIER TUBE. THE METHOD WILL BE PROVED BY PRODUCING A SAMPLE TUBE LOT.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- LASER

(5066) TITLE - 1 TO 3 MICRON AVALANCHE DETECTORS

500

PROBLEM - MANUF. COSTS, VOLUME PROD. TECHNIQUES AND RELIABILITY HAVE TO BE ADDRESSED.

SOLUTION - ESTABLISH MANUFACTURING CAPABILITY FOR VOLUME PRODUCTION OF RELIABLE, LOW COST 1-3 MICRON AVALANCHE DETECTORS.

COMPONENT -- PHOTO/OPTICAL

(5067) TITLE - UNIVERSAL INTEGRATED OPTICS MODULE

700

PROBLEM - PRESENT INTEGRATED OPTICS DEVICES ARE COMPOSED OF SEPARATE LIGHT SOURCE, PROCESSOR AND DETECTOR. IT IS POSSIBLE TO COMBINE THESE COMPONENTS ON A SINGLE CHIP. FABRICATION METHODS AND RELIABILITY HAVE TO BE IMPROVED.

SOLUTION - DEV. FABR. METHODS FOR OPTIMUM INTERFACE OF LIGHT SOURCE AND DETECTOR WITH ACOUSTO-OPTIC DEVICES.

* C A T E G O R Y *

DISPLAYS

COMPONENT -- CRT

(3505) TITLE - HIGH CONTRAST CATHODE RAY TUBE

303

PROBLEM - HIGH CONTRAST CRT AVIONIC DISPLAYS FOR DAY-NIGHT NIGHT VISION GOGGLES ARE CURRENTLY UNAVAILABLE. OPTICAL FILTERS ARE ENVIRONMENTALLY LIMITED FOR THIS APPLICATION. PHOSPHOR TECHNIQUES ARE AVAILABLE BUT OPTIMIZATION AND ECONOMICS HAVE NOT BEEN SHOWN.

SOLUTION - USE OF OPTIMIZED BILAYER TRANSPARENT PHOSPHORS WITH A BLACK ABSORBENT LAYER PROVIDES THE HIGH CONTRAST DISPLAY FOR THE SEVERAL MODES. OPTIMIZATION OF PHOSPHOR TECHNIQUES FOR 5 IN AND LARGER CRT'S WILL BE ECONOMICALLY JUSTIFIED.

(5071) TITLE - TACTICAL COLOR CATHODE RAY TUBE

800

PROBLEM - PRESENTATION OF HIGH DENSITY INFORMATION UNDER TACTICAL CONDITIONS REQUIRES COATING THAT CAN BE PROVIDED BY COLOR. AVAILABLE COLOR CRTS CANNOT SURVIVE TACTICAL CONDITIONS WITHOUT EXPENSIVE AND MARGINALLY EFFECTIVE MODIFICATIONS.

SOLUTION - CRT DISPLAYS CAN BE DESIGNED TO OPERATE UNDER THE VIBRATION, TEMPERATURE AND MAGNETIC ENVIRONMENT OF THE TACTICAL BATTLEFIELD IF THE TOTAL SYSTEM IS DESIGNED FOR THESE CONDITIONS. ECONOMICAL FABRICATION PROCESSES FOR SUCH DISPLAYS MUST BE DEVELOPED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

(CONTINUED)

COMPONENT -- CRT

(5084) TITLE - MINIATURE IMAGE DISPLAYS

PROBLEM - NO PROBLEM GIVEN

SOLUTION - NO SOLUTION GIVEN

COMPONENT -- MISCELLANEOUS

(5036) TITLE - MULTICOLOR GRAPHICS DISPLAY

PROBLEM - TACTICAL MANPACK COMM TERMINALS REQUIRE A LIGHTWEIGHT LOW POWER MULTICOLOR DISPLAY WHICH IS CAPABLE OF GRAPHICS AND IS LEGIBLE IN DIRECT SUNLIGHT. SUCH DISPLAYS ARE PRESENTLY AVAILABLE ONLY AS LABORATORY EVALUATION MODELS AT PROHIBITIVE EXPENSE.

SOLUTION - A MANUFACTURING METHODS PROGRAM MUST BE CONDUCTED SO THAT THESE DISPLAYS CAN BE MANUFACTURED IN LARGE QUANTITIES AT A PRICE WHICH WILL MAKE THEM FEASIBLE FOR TACTICAL USE WHERE THEY ARE BADLY NEEDED.

(5080) TITLE - MINATURE FLAT PANEL 875-LINE DISPLAY

PROBLEM - DOUBLING OF THE RESOLUTION OF THIS DISPLAY OVER THE 525-LINE DISPLAY WILL REQUIRE THE HIGH RESOLUTION ELECTRON LITHOGRAPHY OR X-RAY LITHOGRAPHY IN ORDER TO PRODUCE THEM WITH GOOD YIELD

SOLUTION - DEVELOP PRODUCTION METHODS INCLUDING ELECTRON BEAM LITHOGRAPHY OR X-RAY LITHOGRAPHY FOR FLAT PANEL DISPLAYS.

(5081) TITLE - INTEGRATED 875-LINE LIQUID CRYSTAL DISPLAY CHIP

PROBLEM - THE FABRICATION OF LIQUID CRYSTAL-SILICON DISPLAY CHIPS WITH AN 875X1163 FORMAT AND INTEGRATED DRIVE ELECTRONICS REPRESENTS A TREMENDOUS NUMBER OF ELEMENTS PER CHIP AND SIGNIFICANT YIELD PROBLEMS

SOLUTION - IMPROVE AND AUTOMATE CONTROL OF MULTI-STEP PROCESS FOR FABRICATING THE DISPLAY CHIPS AND ESTABLISH CAPABILITY FOR LARGER WAFERS WITH MORE CHIPS PER WAFER.

* C A T E G O R Y *

*ELECTRON TUBES *

1200

1000

900

850

COMPONENT -- BEAM

(5010) TITLE - BONDED GRID CONVERGENT ELECTRON GUN

867

PROBLEM - PRESENT TECHNOLOGY CAN NOT BE USED TO BUILD GRIDED MILLIMETER WAVE TUBES. MUST USE HIGH VOLTAGE MODULATOR FOR PULSED OPERATION.

SOLUTION - THE PROCESSES OF CHEMICAL VAPOR DEPOSITION OF BORON NITRIDE, GRID FABRICATION AND BONDING OF GRIDS TO THE CATHODE BY LOW COST PRODUCTION TECHNIQUES WILL BE DEVELOPED.

(5019) TITLE - LASER-CUT SUBSTRATES FOR MM TUBES

441

PROBLEM - PRESENT CFA JAMMER TUBES EMPLOY HIGH COST, PRECISION ANODE CIRCUITS LIMITING UTILIZATION IN OPTIMIZED EW SYSTEMS. HIGH PERFORMANCE AND LOW WEIGHT AT MINIMUM COST IS REQUIRED TO FIELD DESIRED EW SYSTEMS.

SOLUTION - UTILIZE LASER-CUT ANODE CIRCUIT SUBSTRATES TO ACHIEVE DESIRED RF PERFORMANCE AND MINIMIZE PARTS AND OVERALL DEVICE COST. ALSO EMPLOY PHOTOLITHOGRAPHIC TECHNIQUES TO FORM MEANDERLINE CIRCUIT. USE BERYLLIA SUBSTRATE MATERIAL FOR DIELECTRIC SUPPORTS.

(5029) TITLE - NON-FERRULE CAVITIES FOR MM WAVE AMPLIFIER TUBES

400

PROBLEM - MILLIMETER RADARS REQUIRE LIGHT WEIGHT LOW COST TRANSMITTER TUBES TO PROVIDE SYSTEMS TO PENETRATE SMOKE AND FOG. PRESENT HAND MACHINING IS EXPENSIVE AND POOR TOLERANCE CONTROL AT MM DIMENSIONS RESULT IN HIGH COST TRANSMITTER TUBES EVEN IN LARGE QTY.

SOLUTION - COMPUTER CONTROLLED ZERO BLANK COINING AND LAPPING METHODS WOULD ELIMINATE COSTLY HAND MACH AND HAND STACKING OF CAVITIES SUITABLE FOR MILLIMETER WAVE TUBES. ADAPTING PRESENT TECH AND ASSEMBLY PROC TO ACHIEVE HIGH YIELD WILL PROVIDE A LOW COST TUBE.

(9970) TITLE - LIGHTWEIGHT LOW COST JAMMER PACKAGE

600

PROBLEM - MANUAL ASSEMBLY OF LARGE NUMBER OF PIECE PARTS MAKES TUBES EXPENSIVE. A LARGE AMOUNT OF HIGHLY SKILLED LABOR IS REQUIRED TO PERFORM ROUTINE REPETITIVE TESTS.

SOLUTION - USE AUTOMATIC CONTROL FOR TEMPERATURE AND VACUUM PROCESSING. FABRICATION OF HELIX CIRCUIT AND SUPPORT RODS, AND DEPOSITION OF ATTENUATOR PATTERN ON THE SUPPORT RODS. USE AUTOMATIC TESTING.

COMPONENT -- CATHODE

(5065) TITLE - LOW COST CURVED CHANNEL MCP'S

600

PROBLEM - CURVED CHANNEL MCP'S PREVENT ION FEEDBACK TO THE PHOTOCATHODES. THEREBY ELIMINATING THE NEED FOR AN ION BARRIER FILM. CURVED CHANNEL MCP'S HAVE ONLY BEEN MADE WITH CRUDE AND EXPENSIVE LAB TECHNIQUES. LOW COST, HIGH VOLUME METHODS ARE NEEDED FOR MANUF

SOLUTION - ESTABLISH MANUF. METHODS FOR LOW COST FABRICATION.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- CATHODE

(CONTINUED)

(5111) TITLE - VAPOR ORGANO METALLIC EPITAXIAL GROWTH PROCESS

950

PROBLEM - LIQUID EPITAXIAL GROWTH PROCESS REQUIRES- A) LARGE AND COSTLY HIGH TEMP REACTORS, B) LARGE QUANTITIES OF SATURATION MELT MATERIALS, C) COSTLY QUALITY GALLIUM ARSENIDE SUBSTRATES, D) LENGTHY OPERATION PROCESS PER SINGLE GROWTH.

SOLUTION - THE VAPOR-ORGANO-METALLIC PROCESS WILL ENABLE MINIMUM FACILITIZATION REQUIREMENTS, USE OF CONTROLLED GASES REQUIRING NO MELT MATERIALS, POSSIBLE USE OF LESS EXPENSIVE SUBSTRATES, AND MULTIGROWTH PRODUCTION ORIENTED PROCESS.

(5117) TITLE - FIELD EMISSION ELECTRON GUNS

500

PROBLEM - TECHNOLOGY TO BUILD HIGH CURRENT DENSITY LOW VOLTAGE MODULATION ELECTRON GUNS FOR HIGH POWER SUBMILLIMETER WAVE TUBES IS NOT AVAILABLE.

SOLUTION - DEVELOP TECHNIQUES FOR MANUFACTURING HIGH CURRENT DENSITY LOW VOLTAGE ELECTRON GUNS FOR SUBMILLIMETER ELECTRON GUNS CAPABLE OF OPERATING FOR HUNDREDS OF HOURS.

(5127) TITLE - REDUCED ION FEEDBACK MICROCHANNEL PLATES

800

PROBLEM - EXTEND TUBE LIFE BY LOWERING CATHODE VOLTAGE AND SIMPLIFYING VACUUM PROCESSING AND FABRICATION TECHNIQUES.

SOLUTION - DEVELOP TECHNIQUES TO PRODUCE THIS TYPE MICROCHANNEL PLATE WITH INCREASED TUBE YIELD.

(5131) TITLE - CCD IMAGER FOR 1-2 MICRON WAVELENGTH REGION

1200

PROBLEM - CURRENT TECHNIQUES FOR PRODUCTION ARE COSTLY.

SOLUTION - DEVELOP PRODUCTION TECHNIQUES TO FABRICATE THESE DEVICES IN A COST-EFFECTIVE MANNER.

* C A T E G O R Y *

* FREQUENCY CONTROL *

COMPONENT -- CRYSTALS

(5055) TITLE - HI RELIABILITY GENERAL PURPOSE CRYSTALS

500

PROBLEM - CRYSTALS USED IN HIGH RELIABILITY TACTICAL RADIOS HAVE A HIGH FAILURE RATE DUE TO FREQUENCY VARIATIONS WITH TIME, TEMPERATURE, SHOCK, AND VIBRATION. LEAKS INTO THE ENCLOSURE ARE A MAJOR PROBLEM.

SOLUTION - PRODUCTION ENGINEERING WILL CLOSELY CONTROL CRYSTAL PLATE GEOMETRY, ORIENTATION, MOUNTING, HERMETIC SEALING AND TESTING OF AT-CUT CRYSTALS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- CRYSTALS

(CONTINUED)

(5069) TITLE - FABRIC OF OVERTONE MINIATURE PRECISION CRYSTALS

PROBLEM - MINIATURIZED PRECISION QUARTZ CRYSTALS IN MICROCIRCUIT PACKAGES ARE FRAGILE AND DIFFICULT TO FABRICATE.

SOLUTION - IMPROVE PRODUCTION TECHNIQUES FOR MINIATURE OVERTONE QUARTZ CRYSTALS THROUGH BETTER POLISHING, HANDLING, MOUNTING/BONDING AND PACKAGING TECHNIQUES.

(5134) TITLE - HIGH PURITY LOW DISLOCATION QUARTZ

PROBLEM - COMMERCIALY AVAILABLE QUARTZ CONTAINS IMPURITIES AND DISLOCATIONS WHICH MAKE THE MATERIAL UNSUITABLE FOR RESONATORS TO BE USED IN SPREAD SPECTRUM SYSTEMS. THIS IS ESPECIALLY TRUE IN RADIATION ENVIRONMENTS.

SOLUTION - ESTABLISH A CAPABILITY FOR MANUFACTURING HIGH PURITY AND LOW DISLOCATION DENSITY QUARTZ.

COMPONENT -- OSCILLATORS

(5070) TITLE - MICROPOWER TIME OF DAY SOURCE

PROBLEM - MICROPOWER PRECISION TIME OF DAY SIGNAL SOURCES FOR OPERATOR INITIATED SECURE NET ENTRY PROCEDURES ARE NOT AVAILABLE.

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR A MICROPOWER PRECISION TIME BASE REFERENCE OSCILLATOR TO BE USED IN ECCM COMMUNICATION RADIO SETS.

(5133) TITLE - STANDARD FREQUENCY/TIME MODULES

PROBLEM - USER ELEMENTS IN MOST MODERN C3 AND POS/NAV SYSTEMS REQUIRE PRECISION CLOCKS THAT NEED TO BE SYNCHRONIZED AT MISSION START TO MASTER TIMING UNITS. SYSTEM SPECIFIC MASTER TIMING UNITS ARE COST INEFFICIENT, REQUIRING SEVERAL DIFFERENT MODULES AT A BASE

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR A UNIVERSAL TIMING MODULE CAPABLE OF SERVICING USER UNITS OF A VARIETY OF DIFFERENT C3 AND POS/NAV SYSTEMS WITH PRECISE SYNCH DATA.

* C A T E G O R Y *

GENERAL

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- COMPONENTS

(5107) TITLE - MILLIMETER WAVE POWER SOURCE COMBINER

1179

PROBLEM - DIODE PARAMETERS VARY GREATLY FROM UNIT TO UNIT. PACKAGING METHODS ARE UNSATISFACTORY FOR COMBINER CIRCUITS. TUNING COMBINER ELEMENTS AND ADJUSTING ASSOCIATED MODULATING CIRCUITS TAKES WEEKS OF EFFORT TO OBTAIN REQUIRED PERFORMANCE LEVELS.

SOLUTION - OPTIMIZE FABRICATION PROCESS AND ESTABLISH TECHNIQUES OF DIODE AND PACKAGE PRODUCTION RESULTING IN HIGH YIELDS OF REPRODUCIBLE COMBINER USABLE DEVICES. OPTIMIZE COMBINER CIRCUITS AND MODULATORS FOR HIGH PERFORMANCE AND UNCOMPLICATED TUNINGS.

(5116) TITLE - INTRINSICALLY TEMPERATURE-COMPENSATED MAGNETS

1250

PROBLEM - PRESENT RARE EARTH MAGNETS HAVE TOO HIGH A TEMPERATURE COEFFICIENT OF REVERSIBLE MAGNETIZATION FOR USE IN ACCELEROMETERS/GYROSCOPES NEEDED IN MISSILE AND MINI-RPV SYSTEMS AND IN SOME NEW MILLIMETER WAVE TRAVELING WAVE TUBES BEING DESIGNED.

SOLUTION - DEVELOP USA MANUFACTURING CAPABILITY FOR SAMARIUM-TWO-COBALT-SEVENTEEN-BASED MAGNETS WITH GADOLINIUM, DYSPROSIUM OR ERBIUM AND TRANSITION METAL SUBSTITUENTS WHICH YIELD ZERO TEMPERATURE COEFFICIENT MATERIALS WITH HIGH ENERGY PRODUCTS.

(5136) TITLE - FERRITE DEVICES FOR MILLIMETER APPLICATIONS

600

PROBLEM - FERRITE DEVICES FOR 35 TO 94 GH FREQUENCIES ARE DIFFICULT TO FABRICATE AND ARE LIMITED IN THEIR PERFORMANCE. REPRODUCIBLE, HIGH PERFORMANCE CHARACTERISTICS ARE DIFFICULT TO ACHIEVE DUE TO SMALL SIZE COMPONENTS AT THESE FREQUENCIES.

SOLUTION - USING NEW DESIGN AND FABRICATION PROCEDURES, RELIABLE FERRITE PHASE SHIFTERS FOR PHASED ARRAY ANTENNAS AND CIRCULATORS WILL BE PRODUCED.

COMPONENT -- MISCELLANEOUS

(5017) TITLE - NON-HERMETIC HYBRID MICROCIRCUITS

1000

PROBLEM - SEALED CHIP TAPE CARRIER TECHNIQUES OFFER LOW COST ASSEMBLY AND ENVIRONMENTAL PROTECTION OF INTEGRATED CIRCUIT CHIPS ON HYBRID MICROCIRCUITS. SIMILAR TREATMENT OF DISCRETE TRANSISTOR AND DIODE CHIPS IS NOT ECONOMICALLY FEASIBLE.

SOLUTION - ESTABLISH PRODUCTION TECHNIQUES FOR SEALING AND HANDLING DISCRETE SEMICONDUCTOR DEVICE CHIPS INCLUDING TESTING AND BONDING OF CHIPS TO HYBRID MICROCIRCUITS.

* C A T E G O R Y *

* INTEGRATED ELECTRONICS *

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- CIRCUITRY

(5027) TITLE - LOW COST HYBRID MICROCIRCUIT MODULES

1000

PROBLEM - HYBRID MICROCIRCUITS WITH MANY LSI, VLSI AND VHSIC CHIPS ON A THICK FILM INTERCONNECT LARGE AREA SUBSTRATES REQUIRE NEW INTERCONNECTION AND SEALING CONCEPTS FOR HIGH SIGNAL PROCESSING.

SOLUTION - ESTABLISH LOW COST MANUFACTURING PROCESSES FOR LARGE AREA HYBRID MICROCIRCUITS IN MODULE FORM REPLACING PC BOARDS AND WHICH INCLUDE INTERCONNECT, SEALING AND PACKAGING SCHEMES FOR MICROWAVE HIGH SPEED AND CONVENTIONAL SIGNAL PROCESSING.

(5034) TITLE - CHARGE COUPLED DEVICE SIGNAL PROCESSORS

700

PROBLEM - EXTENSIVE ENGINEERING WORK IS REQUIRED TO INCORPORATE ANY CCD PROCESSING DEVICE INTO A SYSTEM. ALL INTERFACE CIRCUITRY MUST BE ESPECIALLY DESIGNED AND ASSEMBLED. THERE ALSO EXISTS A VERY LIMITED SELECTION OF COMMERCIAL CCD DEVICES.

SOLUTION - ESTABLISH PRODUCTION TECHNIQUES FOR DESIGN AND FABRICATION OF INTEGRATED CIRCUITS CONTAINING IN ONE CHIP CCD DEVICES, ANALOG CIRCUITRY, AND DIGITAL CIRCUITRY TO PERFORM ALL UNIQUE INTERFACE FUNCTIONS.

(5035) TITLE - HIGH SPEED DIGITAL HYBRID MICROCIRCUITS

1000

PROBLEM - HIGH SPEED DIGITAL ICS, RADAR, VHSIC ARE LEADING TO USE OF DIGITAL TECHNIQUES FOR FRONT END USE IN DIRECT SIGNAL PROCESSING REQUIRE MANY INTERCONNECTIONS BETWEEN ARRAYS OF HIGH SPEED DIGITAL ICS AND HIGH FREQUENCY TRANSMISSION TECHNIQUES.

SOLUTION - ESTABLISH MANUFACTURING PROCESSES AND FACILITIES FOR NEW HYBRID MICROCIRCUIT HIGH SPEED PACKAGING TECHNOLOGIES WHICH ARE CAPABLE OF PROVIDING THE REQUIRED HIGH FREQUENCY TRANSMISSION.

(5074) TITLE - MONOLITHIC K-BAND TRANSMITTER/RECEIVER

1000

PROBLEM - REDUCE TO PRODUCTION ENVIRONMENT RESULTS OF PRIOR R&D TO DEVELOP COMPLETE MICROWAVE TRANSMITTER AND RECEIVER ON A CHIP OF GALLIUM ARSENIDE. TIGHT CONTROL OF LITHOGRAPHIC, THERMAL, AND MATERIALS PROCESSES TO 2 PCT. OR BETTER REQD FOR COST/YIELD GOAL

SOLUTION - USE OF HIGH VOLUME AUTOMATED PROCESSES TO REPRODUCIBLY BATCH FABRICATE CIRCUITS ON ZINC-GALLIUM-ARSENIDE WAFERS. AUTOMATE TESTING AND ESTABLISH PACKAGING TECHNIQUES AMENABLE TO VOLUME PRODUCTION. COST AND YIELD GOALS TO BE BETTER THAN NOW POSSIBLE.

(5085) TITLE - OPTIC DISPLAY EXPANDERS

900

PROBLEM - NO PROBLEM GIVEN

SOLUTION - NO SOLUTION GIVEN

COMPONENT -- CIRCUITRY

(CONTINUED)

(5118) TITLE - DATA AND COMMUNICATIONS SYNTHESIZER

700

PROBLEM - FREQUENCY SYNTHESIZERS ARE AN ESSENTIAL COMPONENT OF VIRTUALLY ALL MILITARY COM. AND DATA LINK EQUIPMENTS. PRESENT SYNTHESIZERS ARE TOO COSTLY, LARGE, AND REQUIRE EXCESSIVE POWER FOR BATTERY OPERATION.

SOLUTION - DEVELOP A SET OF CIRCUITS WHICH CAN BE CONFIGURED TO SATISFY A WIDE VARIETY OF REQUIREMENTS. THE CIRCUITS WILL BE FABRICATED USING AN ADVANCED LOW POWER TECHNOLOGY AND USED IN LARGE QUANTITIES TO ASSURE LOW COSTS.

(5119) TITLE - XRAY LITHOGRAPHIC PRODUCTION TECHNIQUES FOR VHSIC

600

PROBLEM - VHSIC R AND D PROGRAMS WILL DEVELOP PROCESS FOR SUBMICRON HIGH SPEED SIGNAL PROCESSORS. POOR YIELD AND LACK OF PRODUCTION TYPE EQUIPMENT RESULTS IN VERY HIGH COST AND LOW RELIABILITY.

SOLUTION - DEVELOP EQUIPMENT AND PROCESSES TO IMPLEMENT VHSICS ON THE PRODUCTION LINE. INSTITUTE PROCESS CONTROLS TO IMPROVE YIELD. DEVELOP SCREENING AND PRODUCTION TECHNIQUES TO ENHANCE RELIABILITY.

(5120) TITLE - LOW-COST SAPPHIRE SUBSTRATES FOR CMOS CIRCUITS

700

PROBLEM - SOS IC SUBSTRATES MADE FROM SAPPHIRE BOULES ARE COSTLY AND IN LIMITED SUPPLY DUE TO SUBSTRATE PREP. OPERATIONS AND LOW PRODUCTION CAPABILITY. SOS ICs ARE NEEDED FOR HIGH SPEED LOW POWER USE BUT CANNOT BE MADE IN QUANTITY WITHOUT LOW COST SUBSTRATES.

SOLUTION - DEVELOP PRODUCTION METHODS (LOW COST HIGH THROUGHPUT) FOR SUBSTRATES MADE FROM SAPPHIRE RIBBON.

(5121) TITLE - OPTIMIZED SUBSTRATES FOR HYBRID MICROCIRCUITS

750

PROBLEM - EVOLVING HIGH DENSITY HYBRIDS, HIGH SPEED HYBRIDS, AND HIGH WATTAGE HYBRIDS PRESENT GREATER REQUIREMENTS FOR SUBSTRATE DIMENSIONAL STABILITY, THERMAL CONDUCTIVITY, ELECTRICAL PERFORMANCE, PRODUCTIBILITY AND COST.

SOLUTION - OPTIMIZE TWO MAJOR FORMS OF SUBSTRATES-INSULATED METAL AND ORGANIC. ESTABLISH MAJOR PRODUCTIBILITY, YIELD AND PERFORMANCE PARAMETERS. IDENTIFY OPTIMUM METAL SUBSTRATE BASES AND INSULATION AND OPTIMUM REINFORCING FIBERS AND RESIN BLENDS.

(5129) TITLE - HIGH RELIABILITY VHSIC PROCESSES

700

PROBLEM - SUBMICRON VHSIC'S FOR HIGH SPEED SIGNAL PROCESSORS ARE SUBJECT TO EARLY FAILURE DUE TO EXCESSIVE ELECTRICAL STRESSES ON CHIP DIELECTRICS. R&D DESIGNS RESULT IN LOW YIELD AND HIGH COST.

SOLUTION - DEVELOP PRODUCTION PROCESSES FOR HIGH QUALITY GATE DIELECTRICS TO SUSTAIN REQUIRED HIGH FIELD STRESS. DEVELOP ALTERNATE DEVICE FABRICATION SEQUENCES TO REDUCE PROCESS INDUCED DEGRADATION IN DEVICE PERFORMANCES.

COMPONENT -- CIRCUITRY

(CONTINUED)

(5132) TITLE - VHSIC FABRICATION USING ELECTRON BEAM TECHNOLOGY

PROBLEM - SUBMICRON INTEGRATED CIRCUIT FABRICATION METHODS HAVE BEEN DEVELOPED FOR DEVICES HAVING CONDUCTIVE SILICON SUBSTRATES. OTHER CHOICES OF LOW CONDUCTIVITY SUBSTRATES CANNOT BE USED BECAUSE PROCESS CONDITIONS HAVE NOT BEEN DEVELOPED.

SOLUTION - USING SILICON ON SAPPHIRE OR GALLIUM ARSENIDE SUBSTRATES SUBMICRON INTEGRATED CIRCUIT DEVICE PRODUCTION PROCESSES WILL BE DEVELOPED INCORPORATING DIRECT WRITE ELECTRON BEAM PATTERNING

(9905) TITLE - LOW COST MONOLITHIC GALLIUM ARSENIDE MW INTEG CKTS

1179

PROBLEM - SIZE WEIGHT COST CONSTRAINTS LIMIT APPLICATION OF MICROWAVE ICS FOR MANY SYSTEMS APPLICATIONS. DRAMATIC REDUCTIONS PARTICULARLY COST ARE POTENTIALLY AVAILABLE ALONG WITH ORDER OF MAGNITUDE RELIABILITY IMPROVEMENT.

SOLUTION - ESTABLISH PRODUCTION CONTROLS FOR BATCH FABRICATION OF GALLIUM ARSENIDE MONOLITHIC CIRCUIT FUNCTIONS DRAW ON PRIOR R+D AND MMT EFFORTS IN E-BEAM, ION IMPLANT, AND VAPOR EPI TO FULLY AUTOMATE PRODUCTION OF AMPLIFIER AND RECEIVER FUNCTIONS.

(9909) TITLE - PRODUCTION TECHNIQUES FOR SI MW PWR TRANSISTORS

863

PROBLEM - AS THE CONCENTRATION OF INTEGRATED CIRCUITS INCREASES THE HEAT DENSITY IS REACHING THE POINT WHERE IT WILL DESTROY THE SEMICONDUCTOR DEVICES.

SOLUTION - REPLACE THE PRESENT PACKAGING DEVICES WITH UNITS HAVING A HIGH PERCENTAGE OF DIAMOND MATERIAL SO AS TO ACHIEVE A GREATER THERMAL TRANSMISSION.

COMPONENT -- MEMORY

(HH15) TITLE - TAB LEAD BONDING MANUFACTURING INSPECTION

300

PROBLEM - PRESENT METHODS USED TO EVALUATE AND CERTIFY WIRE BONDING IN MICROELECTRONICS ARE NOT READILY APPLIED TO TAPE AUTOMATED BONDING (TAB). MILITARY SCREENING METHODS DO NOT ADDRESS CONFIGURATIONS USED IN TAB AND WOULD MINIMIZE MANY OF THE TAB ADVANTAGES.

SOLUTION - AN INSPECT/VERIFY SYS FOR TAB WHICH INCORPORATES CCTV PATTERN RECOGNITION TO VERIFY BEAM POSITION AND SENSORS TO DETERMINE BEAM HEIGHT. APPLY A SCANNING LASER ACOUSTIC MICROSCOPE IN A NON-DESTRUCTIVE ANALYSIS AND EVALUATION OF THE TOTAL STRUCTURE.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MEMORY

(CONTINUED)

(5128) TITLE - COST EFFECTIVE MILITARY MEMORIES

800

PROBLEM - MILITARY ENVIRONMENTAL CONSTRAINTS CAUSE LOW SCREENING YIELDS AND HIGH COSTS IN HIGH DENSITY MILITARY MEMORY CHIPS, FORCING INCREASED USE OF NON-MILITARIZED PARTS WITH INHERENT RISKS FOR SYSTEMS RELIABILITY.

SOLUTION - YIELD IN MILITARY MEMORY PRODUCTION WILL BE IMPROVED SIGNIFICANTLY BY DESIGNING REDUNDANCY INTO CIRCUITRY AND INTERCONNECTING WORKING SECTIONS AFTER TEST. PROGRAM WILL DEVELOP TECHNIQUES FOR ADAPTIVE DESIGN AND CONNECTING OF REDUNDANT SUBSECTIONS.

* C A T E G O R Y *

LASER

COMPONENT -- GENERAL

(3031) TITLE - 10.6 MICRON CO2 LASERS

27 523

PROBLEM - LASERS CONSTRUCTED IN UNIT QUANTITIES ARE EXPENSIVE AND VARY IN SPECIFICATIONS. PRESENT RANGE FINDER LASERS HAVE REDUCED ALL WEATHER CAPABILITIES AND ARE INEFFECTIVE AGAINST COUNTERMEASURE SMOKES.

SOLUTION - ESTABLISH LARGE SCALE PRODUCTION OF LASER COMPONENTS INCLUDING MIRRORS, ELECTRODES, AND LASER ENVELOPES TO REDUCE COSTS. DEVELOP UNITS THAT ARE RESISTANT TO THE SHOCK AND VIBRATION OF A TANK ENVIRONMENT.

(5113) TITLE - 10-MICRON PULSED WAVEGUIDE LASER

550

PROBLEM - PRESENTLY PULSED WAVEGUIDE CARBON DIOXIDE LASERS FOR USE AS SOURCES FOR MISSILE BEAMRIDERS AND BEACONS ARE FABRICATED IN SMALL QUANTITIES BY HIGHLY SKILLED PERSONS. ELECTRODES, MIRRORS, AND CERAMIC CAVITY HOUSING REQ. PRECISE FABRICATION AND ASSY.

SOLUTION - ESTABLISH LARGE SCALE PRODUCTION OF LASER COMPONENTS INCLUDING MIRRORS, ELECTRODES, AND LASER ENVELOPES TO REDUCE COSTS. DEVELOP UNITS THAT ARE RESISTANT TO THE SHOCK AND VIBRATION OF A TANK ENVIRONMENT.

(5124) TITLE - 10 WATT COHERENT CO2 LASER SOURCE

500

PROBLEM - PRESENT METHODS FOR BUILDING LASER SOURCES ARE LARGELY HAND METHODS USED ON SMALL QUANTITIES OF COMPONENTS.

SOLUTION - DEVELOP MANUFACTURING TECHNIQUES FOR A 10 WATT LASER WITH A HIGH DEGREE OF SHORT TERM STABILITY FOR COHERENT DETECTION APPLICATION, INCLUDING IR RADAR.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL (CONTINUED)

(5135) TITLE - FAR INFRARED LASER JAMMER SOURCE 700

PROBLEM - CO2 LASER SOURCES MUST BE USED FOR OPTICAL COUNTERMEASURES AGAINST THERMAL IMAGES AND OTHER FIR DEVICES.

SOLUTION - DEVELOP COST-EFFECTIVE PRODUCTION TECHNIQUES.

(5136) TITLE - HIGH POWER, TUNABLE, LONG WAVELENGTH INJECTION LASER 1000

PROBLEM - FEW PRODUCTION METHODS HAVE BEEN DEVELOPED FOR HIGH POWER INJECTION LASERS.

SOLUTION - DEVELOP PRODUCTION CAPABILITIES FOR FABRICATING SINGLE AND STACKED INJECTION LASERS AT LONG WAVELENGTH FOR USE IN ADVANCED FIBER OPTICS COMMUNICATION, TRAINING DEVICES AND RANGEFINDERS.

COMPONENT -- MATERIALS

(5122) TITLE - QUATERNARY INJECTION LASERS 800

PROBLEM - NO VOLUME PRODUCTION METHODS EXIST FOR PRODUCING TRAINING LASERS.

SOLUTION - DEVELOP PRODUCTION CAPABILITY FOR INJECTION LASERS FROM VAPOR PHASE EPITAXY FABRICATION METHOD FOR USE IN FIBER-OPTIC COMMUNICATION DEVICES AND EYE- SAFE TRAINING DEVICES.

COMPONENT -- MODULES

(5114) TITLE - MINI LASER TRANSMITTER MODULE 621

PROBLEM - PRESENT LASER TRANSMITTER MODULES FOR MINI LASER SYSTEMS MUST BE ASSEMBLED IN A LAB ENVIRONMENT FROM MANY DISCRETE E-O COMPONENTS AND ARE NOT DESIGNED FOR PRODUCTION

SOLUTION - DEVELOP PRODUCTION METHODS FOR MANUFACTURE AND ASSEMBLY OF MINITURE E-O COMPONENTS USING IC NETWORKS, COMBINED HYBRID UNSTABLE RESONATOR COMPONENTS AND OTHER MFR TECHNIQUES TO FABRICATE AND ASSEMBLE IN A PRODUCTION ENVIRONMENT.

COMPONENT -- RODS

(5153) TITLE - CONSTANT COMPOSITION GROWTH OF NEODYMIUM BOULES 1000

PROBLEM - HIGH QUALITY NEODYMIUM BOULES ARE EXTREMELY DIFFICULT TO GROW, EVEN AFTER TWO PREVIOUS MM&T EFFORTS TO INCREASE SIZE AND YIELD.

SOLUTION - DEVELOP A CONTINUOUS GROWTH PROCESS BY WHICH CRYSTAL BOULES OF CONSTANT COMPOSITION, OR MELT, IS ACCOMPLISHED. THIS IS THE ONLY HOPE FOR MEETING INCREASED MILITARY MARKET DEMAND IN THE FY-84-88 TIME-FRAME.

 * C A T E G O R Y *

 OPTICS

MMT FIVE YEAR PLAN
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(5024) TITLE - BROADBAND MID INFRARED SOURCE

450

PROBLEM - UNIQUE GEOMETRICAL SHAPES MUST BE FABRICATED AND ASSEMBLED IN SOURCE PRODUCTION. HIGH COST RESULTS FROM EXTENSIVE MANUAL LABOR CONTENT. THE TECHNIQUE FOR PRODUCING THE REFRACTORY EMITTER MATERIAL IS MARGINAL IN MATERIAL REPRODUCIBILITY.

SOLUTION - ESTABLISH AUTOMATED TECHNIQUE FOR PRODUCING EMITTER AND HEATER ELEMENTS. ESTABLISH CONTROL OF PROCESS PARAMETERS THAT WILL RESULT IN IMPROVED YIELD OF REFRACTORY EMITTER.

(5046) TITLE - NON-LINEAR GAIN MCP'S FOR 3RD GEN. IMAGE INTENSIFIER

78

PROBLEM - 3RD GEN TUBES REQUIRE NON-LINEAR GAIN MCP'S TO SUPPRESS BRIGHT HORIZON SKY OR OTHER BRIGHT IMAGES WHILE PROVIDING FULL GAIN IN DARK SCENE AREAS. PRESENT MANUF. METHODS FOR MCP ONLY PRODUCE MCP WITH LINEAR GAIN IN THE NORMAL OPERATING RANGE.

SOLUTION - ESTABLISH A NEW HIGH VOLUME MANUFACTURING-PROCESS CONTROL TO ACCURATELY CONTROL NON-LINEAR GAIN CHARACTERISTICS OF THE MCP WHILE MAINTAINING ALL PARAMETERS SUCH AS LOW NOISE, BLEMISHES, FIXED PATTERN NOISE AND ION BARRIER PROTECTION.

(5061) TITLE - MULTI-SPECTRAL COATINGS

750

PROBLEM - DOUBLE BAND PASS 11.06 AND 8-14 MICRON) MULTI-LAYER COATINGS MUST BE PRODUCED ON VARIOUS OPTICAL MATERIALS. THESE COATINGS MUST MEET MIL. STANDARDS FOR HARDNESS WHICH IS A FUNCTION OF THE PROCESS.

SOLUTION - STRICT PROCESS CONTROLS MUST BE ESTABLISHED. MINIMUM TIME BETWEEN LAYER DEPOSITION MUST BE ACHIEVED AND PRODUCTION TECHNIQUES MUST BE DEVELOPED.

(5082) TITLE - INTEGRATED OPTICS BUILDING BLOCK - PHASE I

600

PROBLEM - NO PROBLEM GIVEN

SOLUTION - NO SOLUTION GIVEN

COMPONENT -- WINDOWS/LENSES

(5078) TITLE - PLASTIC IR OPTICAL MATERIAL

950

PROBLEM - INJECTION MOLDING OF NEW MATERIALS USEFUL IN IR PORTION OF SPECTRUM MUST BE ACCOMPLISHED IN PRODUCTION FACILITIES. OPTICAL ELEMENTS MUST BE LARGE, HOMOGENEOUS AND POSSESS THE PROPER SURFACE FIGURE.

SOLUTION - PRESSURE, TEMPERATURE, COOLING CYCLE, FLOW RATE MUST BE PRECISELY DETERMINED TO INSURE LOW COST PLASTIC OPTICS FOR FLIR LENSES.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- WINDOWS/LENSES

(CONTINUED)

(5152) TITLE - PLASTIC OBJECTIVE FOR IMAGE INTENSIFIER SYSTEMS

500

PROBLEM - METROLOGY PROBLEMS HAVE SURFACED IN THE MANUFACTURE OF PLASTIC OBJECTIVE LENSES IN THE ANVIS ED PROGRAM WHICH WILL INCREASE THE UNIT PRODUCTION COST BY FORCING THE USE OF GLASS LENSES, AND ELIMINATE THE WEIGHT ADVANTAGE.

SOLUTION - MANUFACTURING METHODS WILL BE ESTABLISHED FOR NEW METROLOGY OF PLASTIC LENS ELEMENTS WHICH WILL BE UTILIZED TO COMPLETE THE MANUFACTURE OF THE SINGLE CAVITY INSERTS REQUIRED FOR PRODUCTION FOR THE AN/AVS-6, AN/PVS-7, AND AN/PVS-5.

(9845) TITLE - COMPUTER-AIDED FLIR ASPHERIC LENS FABRICATION

365 518

PROBLEM - ASPHERIC LENSES REQUIRED BY FLIR SENSORS HAVE SEVERE WEIGHT AND SIZE LIMITATIONS AND ARE DIFFICULT TO MFG. BECAUSE OF THE REPETITIVE PROCESS OF SURFACE SHAPING.

SOLUTION - PROVIDE MANUFACTURING METHODS FOR PRODUCING ASPHERICAL FLIR LENSES USING A SINGLE POINT DIAMOND TURNING LATHE INTEGRATED WITH COMPUTER CONTROLS AND LASER INTERFEROMETRIC FEEDBACK OF CUTTING TOOL POSITION.

* C A T E G O R Y *

*PASSIVE COMPONENTS *

COMPONENT -- MISCELLANEOUS

(5109) TITLE - ULTRA WIDE BANDWIDTH SAW DELAY LINES

596

PROBLEM - BROADBAND SAW DELAY LINES ARE REQUIRED FOR SIGNAL STORAGE DEVICE BANDWIDTH IS FIXED BY NEED TO STORE SIGNALS FOR A TEN MICROSECOND DURATION FOR SIGNALS RANGING OVER 500 MHZ BAND. DEVICE INSERTION LOSS AND MULTIPLE TRANSMIT REFLECTIONS MUST BE MINIMAL

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR SAW DELAY LINES OPERATING AT 1GHZ USING IDENTICAL BROADBAND, NON-PERIODIC INTERDIGITAL TRANSDUCERS ON LITHIUM NIOBATE SUBSTRATES. HIGH RESOLUTION PHOTOLITHOGRAPHIC FABRICATION WILL USE DIRECT PROJECTION PRINTING.

* C A T E G O R Y *

*POWER SOURCES *

COMPONENT -- MISCELLANEOUS

(5032) TITLE - MM RADAR MODULATOR FOR MINI-RPV AND TUBES

650

PROBLEM - MM RADAR MODULATORS CAPABLE OF SURVIVING A RUGGED ENVIRONMENT WITH HIGH RELIABILITY REQUIRE COMPONENTS OF RUGGED DESIGN. PULSE SHARPENING TECHNIQUES, PULSE CHARGING, AND NANOMSECOND PULSE TRANSFORMER MUST BE COMBINED INTO ONE UNIT.

SOLUTION - FABRICATE IN QUANTITY MM RADAR MODULATOR UTILIZING RECENT COMPONENT IMPROVEMENTS TO MEET MILITARY REQUIREMENTS WITH THE BEST EFFICIENCY, RELIABILITY, COST, WEIGHT POSSIBLE.

* C A T E G O R Y *

*SOLID STATE *

COMPONENT -- DIODES/RECTIFIERS

(3011) TITLE - MILLIMETER-WAVE INDIUM PHOSPHIDE GUNN DEVICES

1179

PROBLEM - INADEQUATE CONTROL OF EPI MATERIAL AND DEVICE PROCESSING STEPS REQUIRING CLOSE TOLERANCES FOR EFFICIENT MM OPERATION RESULTS IN LOW YIELD POOR UNIFORMITY AND HIGH UNIT COST FOR MILLIMETER-WAVE INDIUM PHOSPHIDE GUNN DEVICES.

SOLUTION - PRODUCTION ENGINEERING IN EPITAXIAL MATERIAL PREPARATION, INJECTION-LIMITED CONTACT FORMATION, INTEGRAL HEAT SINK TECHNOLOGY AND PACKAGING WILL ESTABLISH MAVF TECHNIQUES AND CONTROLS RESULTING IN A COST REDUCTION OF MORE THAN TEN TO ONE.

(5041) TITLE - MILLIMETER WAVE MIXERS AND ARRAYS

1152

PROBLEM - LOW NOISE RUGGEDIZED REPRODUCIBLE MIXERS ARE NEEDED FOR RECEIVERS FOR RADAR ELECTRONIC WARFARE TERMINAL HOMING AND MISSILE GUIDANCE.

SOLUTION - IN SITU CONSTRUCTION AND DESIGN WILL PROVIDE REPRODUCIBLE UNITS AT FREQUENCIES FROM 40 GHZ UP TO 600 GHZ. NEW TECHNOLOGIES TO BE DEVELOPED INCLUDE EBEBAM LITHOGRAPHY AND COMPUTER CONTROL OF MATERIALS GROWTH.

(5148) TITLE - IMPATT DIODE SOURCES (94 GHZ)

1150

PROBLEM - NEW DOD ELECTRONIC SYSTEMS OPERATING AT 94 GHZ REQUIRE HIGH PERFORMANCE LOW COST IMPATT DOUBLE DRIFT DIODE SOURCES. ADVANCED IMPATT DIODE FABRICATION TECHNIQUES CURRENTLY UNDER DEVELOPMENT WILL BE IMPLEMENTED.

SOLUTION - ADVANCED FABRICATION TECHNIQUES INCLUDING MOLECULAR BEAM EPITAXY, DIE CASTING AND STAMPING RESONATOR FABRICATION AND BEAM LEAD TECHNIQUES TO ELIMINATE WIRE BONDING PACKAGING. WILL BE UTILIZED. HIGHER YIELD, LOWER COST AND A SECOND VENDOR WILL RESULT.

MMT FIVE YEAR PLAN
RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(5053) TITLE - MILLIMETER-WAVE INTEGRATED CIRCUIT TRANCEIVERS

500

PROBLEM - MILLIMETER WAVE DIELECTRIC WAVEGUIDE INTEGRATED TRANSCEIVER MODULES IN THE 90 TO 220 GHZ REGION ARE DIFFICULT TO FABRICATE AND LIMITED IN PERFORMANCE. REPRODUCIBLE HIGH PERFORMANCE CHARACTERISTICS ARE DIFFICULT TO ACHIEVE WITH PRESENT DESIGN.

SOLUTION - ESTABLISH IMPROVED DESIGN TECHNIQUES FOR INTEGRATED MILLIMETER WAVE DIELECTRIC WAVEGUIDE STRUCTURES SO THAT RELIABLE, HIGH PERFORMANCE TRANSCEIVER MODULES CAN BE FABRICATED IN LARGE QUANTITIES AT MINIMUM COST.

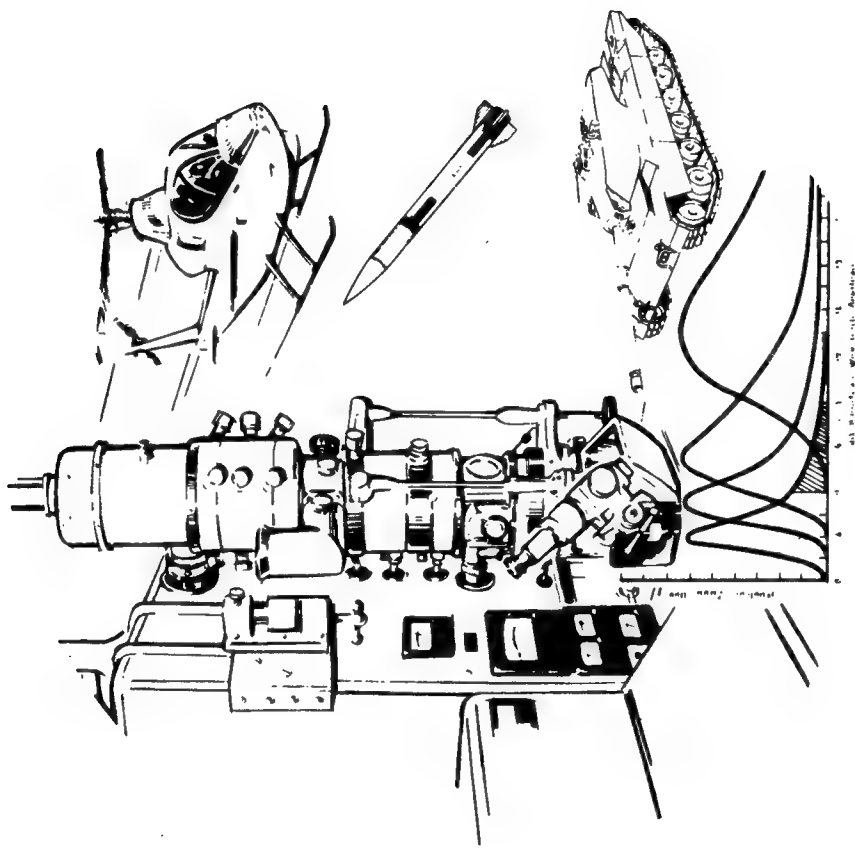
COMPONENT -- SWITCHES

(5031) TITLE - LONG LIFE SPARK GAP

1200

PROBLEM - LASER PULSERS FOR RANGEFINDERS AND DESIGNATORS ARE LIMITED BY SPARK GAP LIFETIMES AND NOT THE LASER. POOR SPARK GAP LIFETIMES DEGRADE SYSTEM RELIABILITY AND INCREASE COST.

SOLUTION - IMPROVE MANUFACTURING TECHNIQUES TO INCORPORATE LOW SPUTTER ELECTRODES INTO SPARK GAPS. IMPROVE TESTING PROCEDURES DURING MANUFACTURE TO ELIMINATE SPARK GAPS WITH POTENTIALLY POOR LIFETIMES.



MATERIALS & MECHANICS RESEARCH CENTER

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US ARMY MATERIALS AND MECHANICS RESEARCH CENTER

(AMMRC)

The Army Materials and Mechanics Research Center (AMMRC) is designated the DARCOM Lead Laboratory for Materials Testing Technology. In this role, AMMRC is responsible for management and direction of the DARCOM materials testing technology activities and formulation of the Materials Testing Technology (MTT) Program. This program formulation is accomplished by identifying and defining materials testing problem areas in response to system requirements of the DARCOM R&D and Readiness Commands and Project Managers utilizing materials testing technology. The Lead Laboratory mission also encompasses the advising and assisting of the major subordinate commands and Project Managers in the utilization of Materials Testing Technology in order to assure a smooth transition from the developmental to the production phases of the life cycle. Concurrent with the above responsibilities is the furnishing of technical assistance in the application of methods and techniques in solving material problems in connection with procured items.

The MTT Program has shown a steady growth over the last several years, from 2.5 million dollars in FY 73 to 4.5 million dollars in FY 79. This growth has been largely due to the increased participation in the Program by DARCOM Project Managers, as well as increased attention to the Program by DARCOM Quality Assurance managers. Another increasing trend within the MMT Program has also been the directing of more and more testing related projects to the MTT Program. Specific areas of effort are as follows:

a. Automated Testing

One of the primary needs in NDT and in inspection in general is to remove the decision-making from the inspector where possible. In FY 80 and beyond efforts will be intensively directed toward providing engineering prototype systems utilizing automated decision-making. These include automated radiographic and ultrasonic techniques, optical/laser techniques, and computerized chemical analysis. The ultimate goal in all automated testing systems is the essential feedback to the total system for automated process control.

b. Predictive Failure

The need for diagnostic measurement techniques for anticipation of catastrophic failure and for the measurement of remaining life, both in operating equipment and in units being overhauled and rebuilt, presents a tremendous opportunity for cost savings and reliability improvement. A principal thrust has come from the loss of diagnostics and in-situ measurements adjunct to non-destructive testing represents the real time use of NDT techniques with analysis and decision elements built in.

c. Materials

As the newer materials are utilized in major weapon systems, it is imperative that new and/or improved inspection techniques be available to measure characteristics or parameters to assure adequate and reliable performance. Of particular interest in the next five years are composites, elastomers, plastics, and ceramics, with continuing interest in metals and energetics (explosives, pyrotechnics, and propellants).

d. Techniques

Specifically covered in the objectives of the MTT Program is the investigation of specific physical principles which can potentially offer significant improvement in sensitivity, cost, portability, or speed, and combination of these. The development and application of techniques, such as ultrasonics, infrared, holography, spectroscopy, chromatography, etc, can significantly improve DARCOM materiel and offer substantial improvement in process control.

The MTT Program effected a test method categories classification change in FY 1980 to more accurately reflect certain current technology interests. Historically, the Program has always included the testing of electronic materials and materiel under one of three broad test method categories: nondestructive, chemical, or mechanical testing. However, electronic materials and materiel are often used in highly mission-critical applications and they usually employ and reflect advanced and sophisticated technologies, not only in their production but in their quality assurance inspection procedures. It was therefore determined that it would be in the best interest of the overall MTT Program to provide enhanced visibility to this highly relevant subject. Accordingly (starting in FY 1983), a fourth MTT test method category was established; namely, "Electronics".

DARCOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 -----	FY82 -----	FY83 -----	FY84 -----	FY85 -----
GENERAL	681	580	850	850	850
TESTING	4102	5000	5000	5500	5500
	-----	-----	-----	-----	-----
TOTAL	4783	5580	5850	6350	6350

MMT FIVE YEAR PLAN
RCS DRCMT 126

* C A T E G O R Y *

GENERAL

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(5052) TITLE - ARMY ENGINEERING DESIGN HANDBOOK FOR PRODUCTION SUPPORT

PROBLEM - TECHNICAL SCIENTIFIC AND ENGINEERING DATA IS CONTINUALLY BEING GENERATED WITHIN THE ARMY AND NEEDS TO BE COLLECTED IN APPROPRIATE DOCUMENTS.

SOLUTION - INITIATE REVISE AND UPDATE DATA USED IN PRODUCTION OF MILITARY HARDWARE AND EQUIPMENT.

(6390) TITLE - PROGRAM IMPLEMENTATION AND INFORMATION TRANSFER

PROBLEM - THE SUCCESS OF THE MMT PROGRAM IS VERY DEPENDENT ON WHETHER THE RESULTS OF MMT WORK GET IMPLEMENTED. THIS IN TURN IS DEPENDENT ON WHETHER INFORMATION CONCERNING THE MMT TECHNOLOGY IS MADE AVAILABLE AND USED BY CONCERNED PARTIES.

SOLUTION - INSURE THAT THE MMT RESULTS ARE DOCUMENTED AND GIVEN WIDE DISTRIBUTION SO AS TO ENCOURAGE IMPLEMENTATION.

* C A T E G O R Y *

TESTING

COMPONENT -- CHEMICAL

(6352) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)

PROBLEM - CURRENT LABORATORY METHODS FOR CHEMICAL TESTING ARE SPECIALIZED AND EXPENSIVE. REAL TIME TESTING TECHNIQUES ARE NEEDED TO CONTROL CHEMICAL PROCESSING.

SOLUTION - ADAPT QUICK RESPONSE CHEMICAL TESTING EQUIPMENT TO AUTOMATE THE CONTROL OF CHEMICAL PROCESSES.

COMPONENT -- ELECTRONICS

(6353) TITLE - MATERIALS TESTING TECHNOLOGY (MMT)

PROBLEM - ELECTRONIC ITEMS AND ANCILLARY DEVICES ARE AMONG THE MOST TECHNICALLY SOPHISTICATED AND MISSION-CRITICAL OF THE ARMY INVENTORY. CURRENT TESTING OF THESE ITEMS IS EQUALLY SOPHISTICATED, TIME-CONSUMING, AND DIFFICULT TO ADAPT TO PRODUCTION ENVIRONMENT.

SOLUTION - ADAPT CURRENT AND DEVELOPING STATE-OF-THE-ART TESTING TECHNIQUES TO SIMPLIFIED, RAPID INSPECTION SYSTEMS FOR ON-LINE REAL-TIME, PRODUCTION QUALITY ASSURANCE.

800 1000 1000

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MECHANICAL

(6351) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)

PROBLEM - METHODS OF MECHANICAL TESTING ARE BASICALLY TIME CONSUMING, LABORATORY TYPE OPERATIONS. THE TESTING IS OFTEN ULTIMATE AND THEREFORE DESTRUCTIVE OR IT TENDS TO INTRODUCE RESIDUAL STRESS/STRAIN IN THE TESTED ITEMS.

SOLUTION - ESTABLISH IMPROVED REAL-TIME INSPECTION TECHNIQUES TO REDUCE PRODUCTION BOTTLENECKS ASSOCIATED WITH MECHANICAL TESTING. ALSO, THE OPTIMUM TESTING CRITERIA WILL BE ESTABLISHED WHEN NECESSARY.

5494 875 1070 975 1000 1000

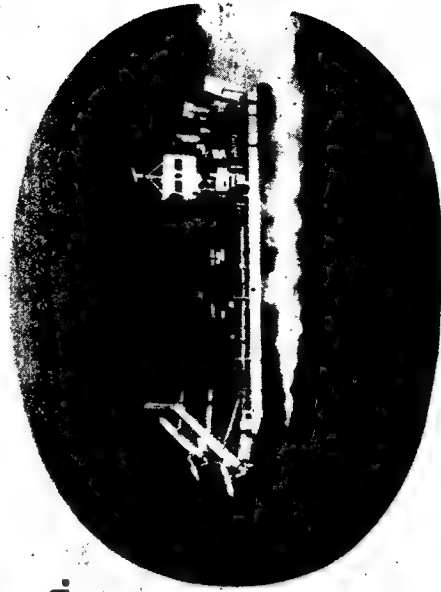
COMPONENT -- NON-DESTRUCTIVE TESTING

(6350) TITLE - MATERIALS TESTING TECHNOLOGY (MTT)

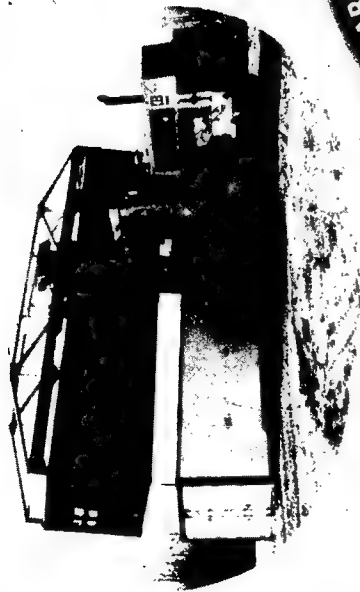
PROBLEM - DESTRUCTIVE AND CERTAIN CONVENTIONAL NON-DESTRUCTIVE TESTING TECHNIQUES ARE RESPECTIVELY UNSUITED AND INADEQUATE OR HARD TO BE ADAPTED TO ON-LINE PRODUCTION TESTING USAGE.

SOLUTION - DETERMINE FEASIBILITY OF ADAPTING LAB-PROVEN NDT METHODS OR MODIFY THE EXISTING TEST PROCEDURES FOR ON-LINE PRODUCTION QUALITY ASSURANCE TESTING.

14480 2313 2820 2600 2900 2900



Fort Belvoir, Va.



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US ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND

(MERADCOM)

MERADCOM, located at Fort Belvoir, VA, conducts a widely diversified program to improve the Army's combat readiness in four major areas: barrier and counterbarrier systems; countersurveillance systems; energy and environmental systems; and supply distribution and construction equipment systems.

Procurements for items under MERADCOM's cognizance are placed with the private sector, and much of MERADCOM's MMT effort is accomplished by the private sector.

To address the problem of increased system acquisition costs, MERADCOM has identified major problem areas where improved manufacturing technology is needed. Major problem areas confronting MERADCOM include:

a. Limitations of High Temperature Super Alloy Components of Gas Turbine Engines. A limiting factor in the life and performance of gas turbines is the ability of the components to withstand the abrasive and corrosive environment at peak operating temperatures. Super alloy metals utilizing strategic materials are limited to 1750°F operating temperature and are subject to catastrophic failure when subjected to high dust concentrations or corrosive atmosphere such as salt. Thermal efficiency can be improved by increasing peak cycle temperature currently limited by maximum operating temperature of materials of the burner, turbine inlet nozzle, and turbine wheel. The most critical component for damage due to wear and corrosion is the turbine nozzle. Materials are needed which have increased operating temperature limits and improved resistance to corrosion and abrasive wear at a reasonable cost.

b. Providing Military Bridges at Moderate Cost, Which Have High Mobility and High Emplacement Speeds While Retaining The Ability to Withstand the Abusive Treatment Inherent in the Battlefield Environment. High strength, low density composite materials in both organic and/or metallic matrix appear to offer great promise for solutions to this problem. Increased production of high strength fiber materials has reduced materials cost. Techniques for the fabrication and installation of these materials into usable bridge components is the area in which large cost reductions are possible. The reduction of presently used labor intensive methods, through the application of automated processes, will reduce component costs. Initial design in these materials offer improved performance due to the flexibility possible in material configuration.

MERADCOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
BRIDGING	563	0	1800	300	400
FIELD FORTIFICATIONS	170	0	0	0	0
GENERAL	224	0	350	350	300
LAND MINES	0	968	808	948	0
POWER SOURCES	422	0	977	577	114
	----	----	----	----	----
TOTAL	1379	968	3935	2175	814

 * C A T E G O R Y *

 *BRIDGING *

MMT FIVE YEAR PLAN
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- REINFORCEMENT

(3745) TITLE - ALUMINUM SKIN-GRAPHITE/EPOXY SANDWICH-BRIDGE REINF 454

PROBLEM - FORMULATION OF PROCEDURES TO MASS PRODUCE ALUMINUM SKIN-GRAPHITE EPOXY SANDWICH MATERIAL FOR BRIDGE STRUCTURAL MEMBERS.

SOLUTION - SANDWICH ALUMINUM SKIN-GRAPHITE EPOXY ALUMINUM SKIN LAMINATE SHOWS PROMISE OF BEING A STRUCTURE THAT WOULD SATISFY OUR NEEDS IF IT CAN BE ECONOMICALLY MASS-PRODUCED USING ROOM CURING ADHESIVES.

(3759) TITLE - KEVLAR CABLE REINFORCEMENT FOR MILITARY BRIDGES 109 400

PROBLEM - TO PROVIDE LIGHT WEIGHT REINFORCEMENT TENSION MEMBER HAVING HIGH TENSILE PROPERTIES AND MODULUS.

SOLUTION - DETERMINE IF KEVLAR MATERIAL CAN BE PRODUCED ON A PRODUCTION BASIS AND MAINTAIN THE HIGH PHYSICAL PROPERTIES REQUIRED IN A REINFORCING MEMBER.

COMPONENT -- STRUCTURAL MEMBERS

(3746) TITLE - METAL MATRIX COMPOSITE MATERIAL 300 300 400

PROBLEM - CONNECTION OF COMPOSITE MATERIAL IS DIFFICULT IN LINEAR PLANAR COMPONENTS. MECHANICAL CONNECTIONS ARE EXPENSIVE IN BOTH DESIGN AND MATERIAL.

SOLUTION - IMBED HIGH MODULUS FIBER MATERIAL IN DUCTILE METAL WHICH CAN BE WORKED AND CONNECTED WITH STANDARD METHODS.

(3761) TITLE - DIMPLE PLATE WEB FOR BRIDGES 400

PROBLEM - HOW TO STABILIZE THIN SHEETS OF ALUMINUM TO CARRY HIGH SHEAR STRESSES WITHOUT BUCKLING.

SOLUTION - CONTROLLED SPACING OF DRAWN DIMPLES OF PLATES AND SPOTWELDED TWO PLATES TOGETHER AT BOTTOM OF DIMPLES TO FORM A SANDWICH PLATE.

(3786) TITLE - MULTI HOLLOW SHEAR WEB MODULE 700

PROBLEM - TO PROVIDE A LIGHT WEIGHT SINGLE PIECE WEB MEMBER WHICH CAN BE EASILY ATTACHED TO TOP AND BOTTOM CHORD MEMBERS.

SOLUTION - WIND THE WEB MODULE ON A LARGE INFLATED CYLINDRICAL MANDREL USING GRAPHITE EPOXY. AFTER WINDING IN UNCURED STATE DEFLATE MANDREL AND FORCE WOUND MEMBER INTO MOLD HAVING DESIRED WEB SHAPE AND CURE.

 * C A T E G O R Y *

 *FIELD FORTIFICATIONS *

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(5053) TITLE - DIGITAL ELEVATION DATA DUBBING FACILITY

170

PROBLEM - TECHNOLOGY EXISTS TO TRANSFER FORMATTED DIGITAL ELEVATION DATA (FOR MAPS) FROM 9-TRACK COMMERCIAL TAPES TO CASSETTES COMPATIBLE WITH THE FIREFINDER SYSTEM. HOWEVER THIS TECH HAS NOT BEEN INTEGRATED INTO VAN-MOUNTED PORTABLE FIELD FACILITIES.

SOLUTION - A PROTOTYPE VAN-MOUNTED DIGITAL ELEVATION DATA DUBBING FACILITY CAPABLE OF EXTRACTING DATA FROM THE DMA 9-TRACK TAPES AND TRANSFERRING IT TO THE FIREFINDER CASSETTES WILL BE FABRICATED.

* CATEGORY *

*GENERAL *

COMPONENT -- MISCELLANEOUS

(3769) TITLE - CONTINUOUS LENGTH FUEL HOSE

424 89

PROBLEM - PRESENT FUEL RESISTANT CONTINUOUS LENGTH HOSE IS MANDREL FABRICATION. FIFTY OR A HUNDRED FEET LENGTH OF HOSE IS FIRST MANDREL MADE AND THEN SECTIONS ARE SPICED TOGETHER FOR THE DESIRED LENGTH. SPICING IS LABOR INTENSIVE.

SOLUTION - EXTRUDE DESIRED LENGTHS OF HOSE WITHOUT SPLICES. FIRE HOSE IS PRODUCED BY THIS METHOD, WHICH IS ALSO APPLICABLE TO FUEL-HOSE. NON-SPLICED, EXTRUDED, CONTINUOUS HOSE WILL BE MORE RELIABLE AND LESS EXPENSIVE THAN PRESENT SPICED HOSE.

(3718) TITLE - DETERMINE PRODUCTION METHODS AIR CYCLE CIRCULATOR

350 350 300

PROBLEM - TECHNICAL INNOVATION HAS PRODUCED AN AIR CYCLE COMPRESSOR-EXPANDER. THE FABRICATION TECHNIQUES AND MATERIALS OF CONSTRUCTION USER TO PRODUCE PROOF OF CONCEPT HARDWARE WILL BE UNECONOMICAL FOR FULL SCALE PRODUCTION.

SOLUTION - DEVELOP NEW MANUFACTURING METHODS TO MACHINE ELLIPTICAL CAM TRACKS INTO END PLATES OF COMPRESSOR-EXPANDER.

(3747) TITLE - LACV-30, SKIRT AND FINGER COMPONENTS

191 135

PROBLEM - FABRICATION OF SKIRT, FINGERS AND CONES IS CURRENTLY HIGHLY LABOR INTENSIVE, LEADING TO HIGH COMPONENT REPLACEMENT COSTS.

SOLUTION - DEVELOP MECHANIZED/AUTOMATED FABRICATION TECHNIQUES TO REDUCE MANUFACTURING COSTS.

MMT FIVE YEAR PLAN
RCS DRCNT 126

FUNDING: (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- NEUTRALIZERS

(3796) TITLE - COMBAT VEHICLE DEGAUSSING

968 808 948

PROBLEM - PRESENT DESIGN AND FABRICATION TECHNIQUES FOR VEHICLES RESULT IN A SIGNIFICANT MAGNETIC SIGNATURE. THIS MAGNETIC SIGNATURE CAN BE USED TO FUZE LAND MINES TO ATTACK THE VEHICLE UNDERCARRIAGE.

SOLUTION - CONSTRUCT A PILOT DEGAUSSING SYSTEM THAT WILL ALLOW DEVELOPMENT OF A DEGAUSSING TECHNIQUE FOR US ARMORED VEHICLES.

* C A T E G O R Y *

*POWER SOURCES *

COMPONENT -- MISCELLANEOUS

(3532) TITLE - MOLTEN SALT LI/CL BATTERY

2165 110 50

PROBLEM - PRESENT LEAD/ACID AND NICKEL/IRON BATTERIES OFTEN NEED RECHARGING IN ORDER TO COMPLETE AN EIGHT HOUR SHIFT.

SOLUTION - ESTABLISH METHODS FOR PRODUCING IN QUANTITY LITHIUM CHLORIDE MOLTEN SALT BATTERIES.

(3772) TITLE - INTEGRATED POWER SWITCH

443 414 114

PROBLEM - THE HIGH POWER SWITCHING CAPABILITY REQUIRES IMPROVED COOLING OF THE POWER STAGE. THIS REQUIRES MECHANICAL AND ELECTRICAL CONSIDERATIONS.

SOLUTION - METHODS MUST BE DEVELOPED TO PRODUCE AND ATTACH HEAT PIPES FOR COOLING DURING QUANTITY PRODUCTION. RELATED ELECTRICAL AND MECHANICAL CHANGES MUST ALSO BE DEVELOPED FOR QUANTITY PRODUCTION.

(3785) TITLE - SENSING AND CONTROL MODULE

424 113

PROBLEM - TRANSFORMERLESS INVERTERS UTILIZE MANY DISCRETE SEMICONDUCTORS INTERCONNECTED TO INTEGRATE CIRCUITS IN LIEU OF TRANSFORMERS BUT RESULTING HEAT DISSIPATION REQUIRES A BULKY PACKAGE WITH REDUCED RELIABILITY.

SOLUTION - DEVELOP MANUFACTURING PROCESS FOR MODULES INCORPORATING INTEGRATED CIRCUITS AND OTHER ELECTRONIC COMPONENTS WITH A LARGE SCALE INTEGRATED CIRCUIT REPLACING DISCRETE DEVICES. MODULES ARE TO INCLUDE SATISFACTORY COOLING DEVICE SUCH AS A HEAT PIPE.

FUNDING (\$000)

PRIOR 81 82 83 84 85

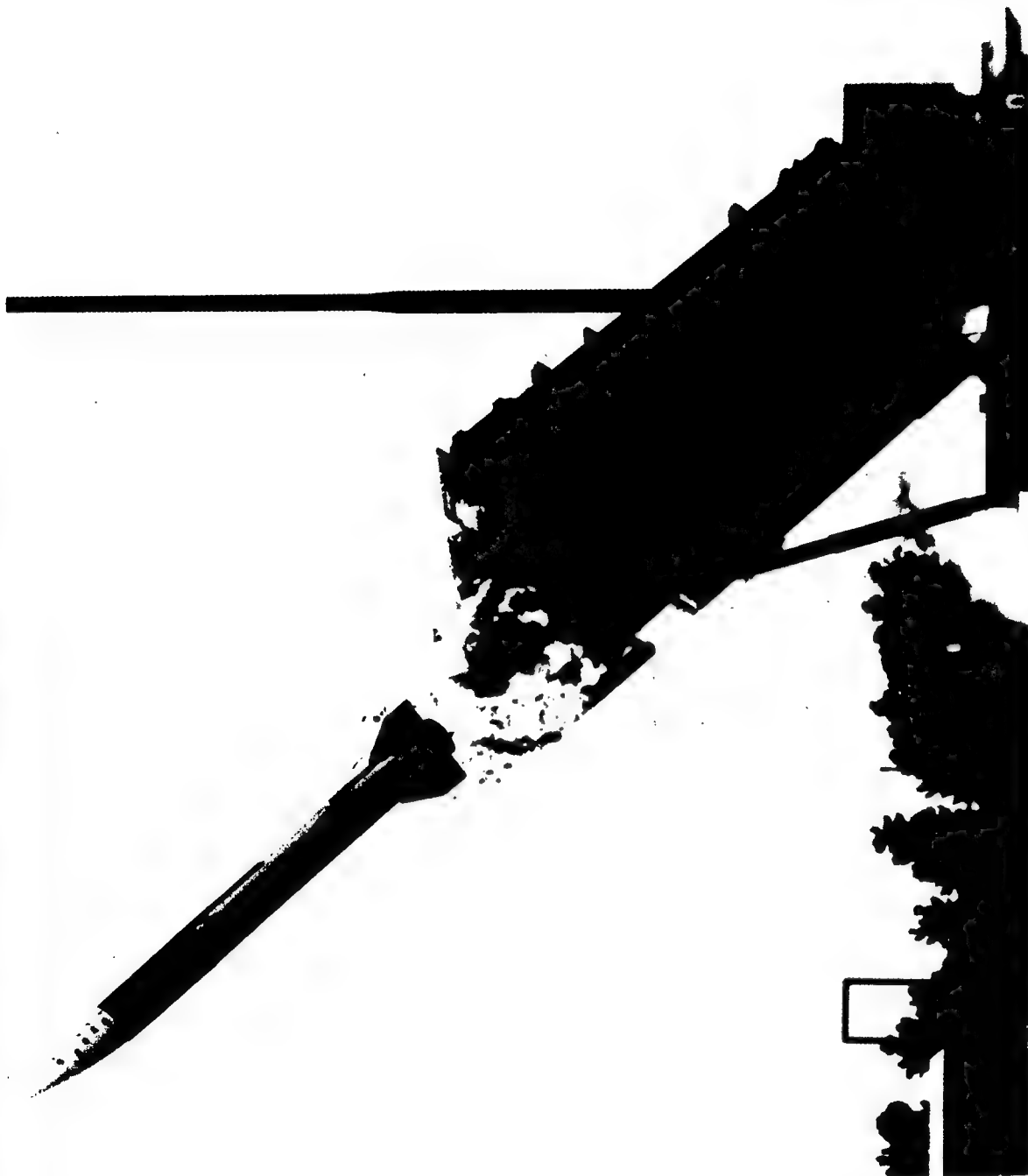
COMPONENT -- TURBINES

(3717) TITLE - HIGH TEMPERATURE NOZZLE FOR 10KW POWER UNIT

775 422

PROBLEM - SUPER ALLOY METALS USED IN HOT COMPONENTS OF GAS TURBINES ARE LIMITED IN OPERATING TEMPERATURE AND ARE SUBJECT TO PREMATURE FAILURE IN DUSTY OR CORROSIVE ATMOSPHERE. ALLOY METALS ARE STRATEGIC MATERIALS AND ARE COSTLY TO MANUFACTURE.

SOLUTION - DETERMINE METHODS AND TECHNIQUES TO REDUCE THE COST OF MANUFACTURING HIGH TEMPERATURE CERAMIC MATERIALS WHICH HAVE BEEN FOUND TO POSSESS HIGH TEMPERATURE RESISTANCE TO DUST ABRASION AND SALT CORROSION. MATERIALS WILL CONTAIN NO STRATEGIC ELEMENTS.



**MISSILE COMMAND
(MICOM)**

CATEGORYPAGE

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US ARMY MISSILE COMMAND
(MICOM)

The US Army Missile Command is located at Redstone Arsenal, AL, and is responsible for research, development, and acquisition of missile systems for the Army. Facilities include flight test ranges, laboratories, and a simulation center.

Major systems managed by special project offices include STINGER (Shoulder-Fired Air Defense Guided Missile), US ROLAND (All-Weather Air Defense Missile System), MLRS (Multiple Launched Rocket System), Viper (Short-Range Anti-Tank Weapon), HELLFIRE (Helicopter-Carried Air-To-Ground Missile), PERSHING (400-Mile Range Air-To-Ground Missile) and the 2.75 Inch Air-To-Ground Rocket. MICOM is also the Army's center for laser research and manages efforts to apply lasers in missile guidance and as weapons.

MICOM supports technological thrusts in the following electronics areas: (1) Manufacturing techniques for multiple chips employing multiple technologies that are projected to be in the mainstream of the semiconductor marketplace for many years to come. (2) Electronic computer-aided manufacturing and hybrid computer-aided design and manufacturing in order to automate microelectronic production lines and therefore improve productivity, increase fabrication speed and decrease unit cost. (3) Elimination of precious metals from military hybrid micro-circuits and their replacement with materials which are universally available and economically attractive.

A major thrust in MICOM's MMT Program is guidance systems. A large amount of this effort is planned for work on gyros, printed circuits, and seekers. Improvements in the gyro can be made by addressing proposals in new machining methods and assembly techniques. Efforts in the electronics area include projects on plated-through holes, thin foils, wave soldering, and cleanliness criteria. The seeker area includes work on infrared optics, radio frequency, and laser optics. Other work planned on guidance systems include projects for windows and radomes, optics, and hybrid circuits.

Another thrust area is missile structures, which includes projects for airframes using metal, plastic, or composites. Efforts for composite airframes will address filament winding, inner shell forming and missile substructures. New joining, machining, and forming technologies will be investigated and applied.

Proposals in the area of test equipment include work on electrical, x-ray, neutron and hydraulic equipment. Calibration efforts include infrared testing of PC boards, digital fault isolation, and automatic circuit tuning.

C O M M A N D F U N D I N G S U M M A R Y
MICOM
(THOUSANDS)

CATEGORY -----	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
CONTAINERS/LAUNCHERS	350	0	0	338	300
CONTROL SYSTEM	2200	2023	5000	12350	12500
GENERAL	0	0	1450	1250	1250
GROUND SUPPORT EQUIPMENT	375	0	1630	2000	925
GUIDANCE SYSTEM	7705	4399	12613	10804	7100
MISSILE STRUCTURE	794	241	1450	1890	2575
PROPULSION SYSTEM	3954	4561	3380	1575	2075
TEST EQUIPMENT	2086	1732	2032	1440	1490
	----	----	----	----	----
TOTAL	17464	12956	27555	31647	28215

 * C A T E G O R Y *

 *CONTAINERS/LAUNCHERS *

MMT FIVE YEAR PLAN
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- LAUNCHERS

(1027) TITLE - LOW COST SMALL ROCKET CONTAINER/LAUNCHER PODS

PROBLEM - CURRENT LAUNCH PODS ARE EXPENSIVE AND REQUIRE REUSE IN ORDER TO MAINTAIN COST PER ROUND AT AN ACCEPTABLE LEVEL.

SOLUTION - LOW COST PLASTICS WILL BE APPLIED TO THE STRUCTURE. COMMERCIAL GRADE PLASTICS SUCH AS ABS, PVC, AND FOAMS IN MOLDED AND FORMED SHAPES WILL BE CONSIDERED. LONG TERM SERVICE ENVIRONMENT WILL BE EVALUATED BY ACCELERATED AGING AND CREEP TESTING.

338 300

(1045) TITLE - RAPID CURE FOAM-IN-PLACE

PROBLEM - PRODUCTION PROCESSES FOR FOAM-IN-PLACE MATERIALS ARE NOT CONDUCTIVE FOR HIGH RATE PRODUCTION OF LARGE STRUCTURES. PROBLEMS INCLUDE NON-UNIFORM DENSITY, SLOW FOAMING, AND VOIDS IN CONSTRICTED PARTS.

SOLUTION - IMPROVE MFG METHODS REQUIRED TO FABRICATE LARGE, COMPLEX STRUCTURES. THIS WILL INCLUDE OPTIMIZATION OF FOAM PLACEMENT METHODS, TOOLING CONCEPTS, AND MATERIALS SYSTEMS TO SUPPORT HIGH RATE, LOW COST PRODUCTION.

350

 * C A T E G O R Y *

 *CONTROL SYSTEM *

COMPONENT -- CIRCUITRY

(1063) TITLE - SEMIADDITIONAL REEL TO REEL FLEX PRINT PROCESS

PROBLEM - CONVENTIONAL BATCH PROCESSING OF PRINTED WIRING BOARDS IS LABOR INTENSIVE. HAND LABOR IS BOTH COSTLY AND SUBJECT TO ERRORS WHICH ADDS REJECT LOSSES TO LABOR COSTS.

SOLUTION - A REEL TO REEL MFG PROCESS FOR PWB'S WILL PRODUCE COMPLETE PWB'S FROM REELS OF CLAD STOCK IN A SEQUENTIAL SET OF OPERATIONS. THE OUTPUT CIRCUITS WILL BE FLAT CABLE OR FLEXIBLE CIRCUITRY.

350

421

(1071) TITLE - HYBRID INTEGRATED CAD AND MANUFACTURING (HICADAM)

PROBLEM - HYBRID CIRCUIT DESIGN AND MANUFACTURE IS LABOR INTENSIVE. THE CAD DATA BASE HAS NOT BEEN EXTENDED TO MANUFACTURING PROCESS CONTROL.

SOLUTION - ANALYZE FUNCTIONAL FLOW AND MANUFACTURING PROCESS CONTROLS AND MODIFY THE DESIGN DATA BASE TO MAKE IT CAPABLE OF DEFINING FUNCTIONS, INPUT, OUTPUT, CONTROLS AND INTERFACES. USE ICAM METHODOLOGY TO DEVELOP SYSTEM ARCHITECTURE.

100

1000

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- CIRCUITRY

(CONTINUED)

(11075) TITLE - ELECTRONICS COMPUTER AIDED MANUFACTURING (ECAM)

PROBLEM - ALTHOUGH INTEGRATED CIRCUITS, HYBRID CIRCUITS, PRINTED CIRCUITS AND CABLES ARE DESIGNED ON A COMPUTER, THERE IS LITTLE COMPUTERIZED CONTROL OF PROCESSES USED TO PRODUCE THESE ITEMS. A MASTER PLAN IS NEEDED TO DEFINE THE AREA AND REQUIREMENTS.

SOLUTION - DEVELOP A DOD MASTER PLAN FOR COMPUTER-AIDED DESIGN AND MFG OF ELECTRONIC SYSTEMS. USE AIR FORCE'S ICAM AND NASA'S IPAD PROGRAMS TO DEFINE CAD/CAM AND ELECTRONIC TECHNOLOGIES TO MAKE INTEGRATED CIRCUITS, HYBRID CIRCUITS, PRINTED CIRCUITS, AND CABLES.

(11091) TITLE - ELIM OF PRECIOUS METALS MICROCIRCUIT APPLICATIONS

PROBLEM - ELIMINATE USE OF NOBLE OR PRECIOUS METALS BY ESTABLISHING A THICK FILM PASTE USING BASE METAL AS A COPPER OR NICKEL IN THE FABRICATION PROCESS OF MICROCIRCUIT PACKAGES.

SOLUTION - USE NON-NOBLE METALS ELIMINATING THE REQUIREMENTS FOR GOLD. APPLICATION OF NON-NOBLE METALS WOULD BE ESTABLISHED BY DETAILED ANALYSIS OF MATERIAL COMPATABILITY.

(1109) TITLE - ROBOTIZED WIRE HARNESS ASSEMBLY SYSTEM

PROBLEM - WIRE HARNESS FABRICATION IS A LABOR INTENSIVE PROCESS. APPROXIMATELY 50% OF HARNESS FABRICATION TIME IS DEVOTED TO HANDLING, SORTING, AND IDENTIFICATION. HARNESS ASSEMBLY IS DONE BY HAND. PROCEDURES USE SEVERAL WORKSTATIONS AND REPEATED HANDLING.

SOLUTION - A COMPUTER CONTROLLED MANIPULATOR (ROBOT) WITH SIX DEGREES OF FREEDOM INCORPORATES WIRE PREPARATION, HARNESS ASSEMBLY, AND TESTING INTO A SINGLE WORKSTATION. AN INTEGRATED SYSTEMS APPROACH WILL INCORPORATE STATE-OF-THE-ART EQUIPMENT AND TECHNIQUES.

(3108) TITLE - MISSILE/ROCKET DISPENSING SYSTEM

PROBLEM - DISPENSING UNITS ARE FABRICATED, ASSEMBLED, AND TESTED BY HAND.

SOLUTION - ESTABLISH AUTOMATED AND SEMI-AUTOMATED SYSTEM FOR PRODUCING THE DISPENSING DEVICE

* CATEGORY *

*GENERAL *

300 700 1000 3000 10000 10000

2000 2000 2000

150 602

350 500

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(1085) TITLE - ELIMINATE GOLD ON SWITCH CONTACTS.

PROBLEM - ELIMINATE THE USE OF GOLD ON COMMERCIAL AND MILITARY HIGH RELIABILITY SWITCH CONTACTS.

SOLUTION - ESTABLISH A LESS EXPENSIVE METAL OR ALLOY IN PLATING CONTACTS.

(1102) TITLE - LITHOGRAPH FOR MICROCIRCUIT CHIPS

PROBLEM - CURRENT METHODOLOGY FOR THE GENERATION OF PHOTO LITHOGRAPHY EQUIPMENT IS APPROACHING THE DIFFRACTION LIMIT OF LIGHT. THIS CONDITION RESULTS IN POOR PATTERN REPLICATION AND INCREASE IN DEFECTS.

SOLUTION - ESTABLISH AN X-RAY LITHOGRAPHY PROCESS WHERE REPRODUCTION OF PATTERNS UP TO 1 CM SQUARE ARE ACCURATE.

* C A T E G O R Y *

GROUND SUPPORT EQUIPMENT

COMPONENT -- CIRCUITRY

(1056) TITLE - MILLIMETER WAVE OSCILLATORS FOR MONOPULSE RECEIVERS

PROBLEM - DEVELOPMENT OF A 140 GHZ GUIDANCE SYSTEM IS HAMPERED BY HIGH COST AND LOW EFFICIENCY OF THE MACHINED WAVEGUIDE VARACTOR MULTIPLIERS. GUNN OSCILLATORS, THE ONLY PRACTICAL ONE FOR INPUT, HAS BORDERLINE POWER LEVELS.

SOLUTION - USE THE SEMI-ADDITIVE PWB MFG PROCESS TO ELECTROPLATE SILVER ON LOW LOSS SUBSTRATES TO FORM 1) A LOW FREQUENCY INPUT BAND PASS FILTER MATCHING THE GUNN, 2) A NON LINEAR VARACTOR ELEMENT, AND 3) A HIGH FREQUENCY OUTPUT BAND PASS AT 140 GIGAHERTZ.

(1065) TITLE - PROD OF QUIET RADAR SIGNAL PROCESSORS USING VLSI TECHNOLOGY

PROBLEM - THE MAN TECH BASE TO PRODUCE RADAR SIGNAL PROCESSORS USING VHSI (VERY HIGH SPEED INTEGRATED CIRCUITS) DOES NOT EXIST. METHODS USING LSI (LARGE SCALE INTEGRATED) CHIPS ARE INADEQUATE. HOWEVER, SOME TECHNIQUES MAY BE TRANSLATABLE TO VLSI.

SOLUTION - THIS PROJECT WILL USE FOUR CHIPS DEVELOPED UNDER ANOTHER MMT PROGRAM TO ESTABLISH MANUFACTURING METHODS FOR THE QUIET RADAR SIGNAL PROCESSOR. PROJECT WILL REDUCE COST AND IMPROVE RELIABILITY AND MAINTAINABILITY.

200

1250 1250 1250

500 500 500

450 550

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- CIRCUITRY

(CONTINUED)

(1105) TITLE - PRODUCTION METHODS FOR A LOW SIDELOBE ANTENNA NETWORK

PROBLEM - CURRENT MANUFACTURE OF AIR STRIPLINE NETWORKS FOR LOW SIDELOBE ANTENNA ARE EXPENSIVE BECAUSE OF LARGE BOARD SIZE WITH ACCURATE DIMENSIONAL TOLERANCE REQUIREMENTS.

SOLUTION - ESTABLISH METHODOLOGY REDUCING THE LINE LENGTH TRIMMING. AUTOMATE PLACEMENT AND SOLDERING OF ISOLATION RESISTORS AND THE PLACEMENT OF GROUND PLANE SPACERS REDUCING HAND LABOR.

(3214) TITLE - INJECTION MOLDING ELECT. CONNECTORS + CABLES

PROBLEM - STRAIN RELIEF POTTING AND MOLDING, AND ENVIRONMENTAL SEALING OF ELECTRICAL CABLE AND OF CONTACTOR ASSEMBLIES IS COSTLY.

SOLUTION - THE CABLES WILL BE INJECTION MOLDED IN A 4 STEP PROGRAM. INJECTION MOLDING WITH A COST ANALYSIS WILL BE MADE. DESIGN, FAB & MOLDING GUIDELINES WILL BE DEFINED. QUALIFICATION METHODS WILL BE DEFINED. CURRENT HARDWARE WILL BE PROCESSED AND EVALUATED.

(3376) TITLE - TESTING ELECTRO-OPTICAL COMPONENTS AND SUBSYSTEMS

PROBLEM - MANUFACTURING TECHNOLOGY NECESSARY FOR PRODUCTION OF ELECTRO-OPTICAL SYSTEMS IS VERY LIMITED. LITTLE CORRELATION EXISTS BETWEEN COMPONENT SPECIFICATIONS AND THE PARAMETERS THAT IMPACT SYSTEM PERFORMANCE.

SOLUTION - ECONOMY OF PRODUCTION, TESTING METHODS, OR TECHNIQUES COULD BE DEVELOPED BY VALIDATING EXISTING SPECIFICATIONS OR REPLACING EXISTING ONES WITH SPECIFICATIONS THAT ARE BASED ON SYSTEM PERFORMANCE RATHER THAN COMPONENT PERFORMANCE.

COMPONENT -- GENERAL

(3238) TITLE - MANUFACTURING COST ANALYSIS (CAM)

PROBLEM - THERE IS A NEED TO DEFINE AND CONTROL ACQUISITION PROGRAM COST DURING CONTRACT DEFINITION AND DEVELOPMENTAL PHASES.

SOLUTION - STRUCTURE COMPUTER MODEL TO CALCULATE THE LABOR CONTENT OF A DESIGN CONCEPT IN STANDARD SETUP AND RUN TIME.

(3437) TITLE - RECOVERY/RECYCLING OF HEAVY METAL FROM SPENT PROCESSING SOLS

PROBLEM - THE PRESENT NATIONWIDE PRACTICE FOR THE DISPOSAL OF WASTE PRECIOUS METAL MATERIALS IS TREATMENT IN A CONVENTIONAL WASTE TREATMENT PLANT.

SOLUTION - DEVELOP ONE OR MORE SYSTEMS AND PROCESSES THAT WILL RECOVER THESE PRESENTLY DISCARDED MATERIALS IN A SALEABLE RE-USABLE FORM.

280 500

400

675 375

200 175

250 250

*****		MMT FIVE YEAR PLAN					
* C A T E G O R Y *		RCS DRCMT 126					

GUIDANCE SYSTEM							

COMPONENT -- BATTERIES							
(3280) TITLE - ENG. ANAL. OF MFG PARAMETERS FOR THERMAL BATTERIES		145		340			
PROBLEM - SLIGHT VARIATIONS IN MANUFACTURING PARAMETERS HAVE A GREATLY MAGNIFIED EFFECT ON FINAL BATTERY PERFORMANCE AND AS A RESULT REJECTION RATES ARE HIGH.							
SOLUTION - OPTIMIZE EACH FACET OF MANUFACTURING TECHNIQUES BY STATISTICALLY CORRELATING VARIED PARAMETERS.							
(3281) TITLE - SILVER ZINC GUIDANCE BATTERIES (CAM)		250		250		250	
PROBLEM - ANODE AND CATHODE MANUFACTURING FOR SILVER ZINC BATTERIES IS BASED ON TWENTY YEAR OLD TECHNIQUES. REQUIREMENTS CALL FOR IN LINE PRODUCTION AND ACCEPTANCE TESTS.							
SOLUTION - DEVELOP A COMPUTER AIDED MANUFACTURING PROCESS FOR SILVER-ZINC BATTERIES WITH CONTROLLING SENSORS FOR ACCURATELY MEASURING MATERIALS AND ELECTROCHEMICAL COMBINATION.							
COMPONENT -- GENERAL							
(1101) TITLE - SINGLE CRYSTAL SILICON FOR VLSI						750	
PROBLEM - SINGLE CRYSTAL SILICON PROCESSES AND MATERIALS ARE CURRENTLY PROPRIETARY.						750	
SOLUTION - ESTABLISH A PROCESS GROWING 2-INCH DIAMETER SINGLE CRYSTALS.						750	
COMPONENT -- HYBRIDS							
(1059) TITLE - ELECTRICAL VERIFICATION AND BURN-IN FOR IN-PROCESS HYBR CHIP				400			
PROBLEM - INSTALLATION OF BAD CHIPS IN HYBRID CIRCUITS IS A CONTINUING PROBLEM. CHIPS ARE TESTED BY PROBE CHECKING, AND WHEN POSSIBLE ARE REMOVED AND REPLACED. ACCEPTANCE PROCEDURES MUST INCLUDE A LOT ACCEPTANCE PROCEDURE IN ADDITION TO PROBING & VISUAL INSP.							
SOLUTION - MODIFY TAPE LEAD CARRIER TO PREVENT INSTALLATION OF BAD CHIPS IN HYBRID CIRCUITS. DEVELOP THE PROCESS TO PROBE CHECK A CHIP AND TO REMOVE IT FROM HYBRID CIRCUIT PRODUCTION IF CHIP IS BAD. ADAPT PROCEDURES TO TEST EQUIPMENT AND BURN-IN EQUIPMENT.							
(1066) TITLE - ADDITIVE SINGLE AND MULTILAYER HYBRID CIRCUITRY				250			
PROBLEM - THICK FILM CIRCUITRY USES THE SCREEN AND FIRE PROCESS ON CERAMIC SUBSTRATES. A SEMIADDITIVE FINE-LINE PROCESS, ELECTROLESS COPPER PLATING, USED ON FIBERGLASS AND CERAMIC SUBSTRATES WILL PROVIDE BETTER FINE-LINE AND A COST REDUCTION.							
SOLUTION - LAMINATE SURFACE CONDITIONS AND ELECTROLESS COPPER CATALYST STRENGTHS WILL BE INVESTIGATED. VARIATIONS IN PROCESSING PARAMETERS WILL BE EVALUATED. SOFTWARE TECHNIQUES FOR AUTOMATION OF MANUFACTURING PROCESSES WILL BE DEVELOPED.							

FUNDING (\$000)

PRIOR 81 82 83 84 85

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- HYBRIDS

(CONTINUED)

(1095) TITLE - AUTOMATIC SEALING OF HYBRIDS

250

PROBLEM - HYBRID CIRCUIT ASSEMBLIES FOR MILITARY USE REQUIRE HERMATIC SEALING WHICH IS ACCOMPLISHED BY SOLDERING OR WELDING. BOTH TECHNIQUES REQUIRE AN OPERATOR, INVOLVING LABOR INTENSIVE HANDLING AND SET UP ERRORS.

SOLUTION - ESTABLISH AN AUTOMATIC HERMATIC SEALING SYSTEM USING A COMPUTER OR MICROPROCESSOR BASE AND BY MODIFYING EXISTING HERMATIC SEALING EQUIPMENT.

(3110) TITLE - HYBRID CIRCUIT ASSEMBLY UTILIZING AUTOMATED TECHNIQUES

650

PROBLEM - FILM HYBRID CIRCUITS ARE PRESENTLY MANUFACTURED IN A LABORATORY ATMOSPHERE BY ONLY A FEW PRODUCERS.

SOLUTION - CONVERT LABORATORY TECHNIQUES INTO PRODUCTION METHODS UTILIZING AUTOMATED COMMERCIAL EQUIPMENT

(3182) TITLE - PRODUCTION TOOLING TECHNIQUES FOR MODULAR ELECTRONICS

400 400

PROBLEM - VERY DENSE PACKAGING MAKES ASSEMBLY VERY COSTLY.

SOLUTION - THERE ARE NO FABRICATION TECHNIQUES FOR PLACING LEADLESS INVERTED DEVICES (LID'S) AND COMPONENT CHIPS DIRECTLY ONTO PRINTED CIRCUIT BOARDS.

(3439) TITLE - LOW COST HYBRID MICROELECTRONIC CIRCUITS

350

PROBLEM - DESIGN CRITERIA AND COMPONENT SELECTION AFFECT THE TOTAL HYBRID FABRICATION CYCLE TO AN EXTENT THAT CONSTANT MACHINE OPERATOR ATTENTION IS REQUIRED.

SOLUTION - DETERMINE THE COST DRIVERS OF HYBRID CIRCUIT FABRICATION AND TEST. DEFINE FINITE PROBLEMS TO ALLOW MORE ECONOMICAL METHODS FOR MACHINE OPERATIONS.

COMPONENT -- INTEGRATED ELECTRONICS

(1030) TITLE - AUTO TEST, MOUNTING + STACKING OF LOCASERT NONAXIAL DEVICES

230

PROBLEM - PRESENT METHODS OF MOUNTING AND TESTING PARTS USING LOCASERTS ARE 10PCT HIGHER THAN THEY WOULD BE WITH AUTOMATED METHODS.

SOLUTION - PROVIDE A SYSTEM THAT WILL AUTOMATICALLY DETECT DEVICE ORIENTATION, POSITION THE DEVICE, INSERT THE DEVICE INTO THE LOCASERT, ELECTRICALLY TEST THE DEVICE AND MOUNT THE DEVICE INTO STICKS FOR THE INSERTION MACHINE.

COMPONENT -- INTEGRATED ELECTRONICS

(CONTINUED)

(1031) TITLE - HIGH SPEED PLATING OF CARD EDGE CONTACTS.

722

PROBLEM - MASKING OF THE CONNECTOR IS AN EXPENSIVE PROCESS AND REQUIRES A CLEANING PROCESS TO REMOVE THE RESIDUE FROM THE TAPE. THE ADJACENT PLATING JUNCTION OF DISSIMILAR METALS REQUIRES STRICT CONTROLS TO PREVENT HAIRLINE CRACKS.

SOLUTION - DEVELOP HIGH SPEED PULSE PLATING OF THE CONTACTS. THIS WILL ELIMINATE THE REQUIREMENT FOR MASKING, CLEANING TO REMOVE THE MASKING RESIDUE AND REDUCE COST.

(1055) TITLE - REMOVE GOLD FROM COMPONENT LEADS

150

PROBLEM - GOLD PLATING, USED ON MOST ACTIVE DEVICE LEADS MUST BE REMOVED BY MANUAL DOUBLE SOLDER DIPPING PER MIL STANDARDS. THIS IS SLOW AND COSTLY BUT NECESSARY TO PREVENT GOLD EMBRITTEMENT OF SOLDER JOINTS WHICH COULD RESULT IN PREMATURE FAILURE.

SOLUTION - DEVELOP AN AUTOMATED MACHINE FOR REMOVING GOLD FROM COMPONENT LEADS BY THE REQUIRED DOUBLE SOLDER DIP METHOD.

(1058) TITLE - SUBMINITURE COMPONENT PACKAGING

400

PROBLEM - ULTRA HIGH DENSITY PWB'S ARE NEEDED AND CAN NOW BE MANUFACTURED WITH 5 MIL LINES AND 5 MIL SPACES. THIS ORDER OF BOARD DENSITY CANNOT BE FULLY UTILIZED WITH A SERIES OF CASES SUCH AS TO-CANS AND DIPS, SINCE THEIR LEAD SPACES REQUIRE TOO MUCH AREA.

SOLUTION - ADAPT THE HERMETICALLY SEALED (PASSIVATED) CHIP TO THE NEW ULTRA HIGH DENSITY PWB. HYBRID TYPE COMPONENTS WILL REQUIRE LITTLE MODIFICATION. ACTIVE DEVICES - TRANSISTORS AND INTEGRATED CIRCUITS - WILL REQUIRE PASSIVATION.

(1061) TITLE - STANDARDIZED MASKING TECHNIQUES FOR PWB ASSEMBLIES

250

PROBLEM - NO STANDARDIZED CONFORMAL MASKING TECHNIQUES ARE IN EXISTENCE THROUGHOUT INDUSTRY. MATERIALS AND TECHNIQUES ARE SELECTED BY PERSONNEL ACCORDING TO THEIR OWN JUDGEMENT PRIOR TO CONFORMAL COATING. DAMAGE RESULTS WHEN WRONG JUDGEMENT WAS USED.

SOLUTION - DEVELOP STANDARDIZED MASKING MATERIALS AND TECHNIQUES BASED UPON WHICH TYPE OF AREAS ON THE PWB ASSEMBLY ARE TO BE FREE OF CONFORMAL COATING. PARAMETERS SUCH AS TERMINAL GEOMETRY, HOLE PATTERNS, HEAT SINK ZONES WILL BE EVALUATED.

COMPONENT -- INTEGRATED ELECTRONICS

(CONTINUED)

(1062) TITLE - PREVENTING BRITTLE COPPER CIRCUITRY

380

PROBLEM - BRITTLE CLADDING FOIL AND BRITTLE ELECTRODEPOSITED COPPER FOR PWB'S IS A PREVALENT PROBLEM. NO PROCEDURE EXISTS FOR THE EARLY DETECTION OF EMBRITTLEMENT IN COPPER ELECTRODEPOSITS.

SOLUTION - MEASURE THE DUCTILE-TO-BRITTLE TRANSITION IN COPPER DEPOSITS. THE MEASUREMENT OF BRITTLE TRANSITION PROVIDES A MEANS FOR THE EARLY DETECTION OF THE CHANGE FROM DUCTILE TO BRITTLE.

(1067) TITLE - USE OF ELECTROLESS NICKEL BORON ON PWB CONNECTORS

350

PROBLEM - GOLD OVER NICKEL PLATING USED ON ONE PIECE CARD EDGE CONTACTS IS A MAJOR COST ITEM. THE COST CAN BE REDUCED BY REPLACING GOLD WITH A BASE METAL ALLOY.

SOLUTION - NICKEL BORON PROVIDES A SATISFACTORY CONTACT MATERIAL AND HAS AN INEXPENSIVE ELECTROLESS PLATING PROCESS. THE REMAINING PROBLEMS OF UNWANTED PLATING AND OCCASIONAL FAILURES TO STRIKE SEEM TO HAVE A HIGH PROBABILITY FOR SOLUTION.

(1072) TITLE - MULTIPLE HIGH RELIABILITY/LOW VOLUME LSI MFG

1540 1444 1200

PROBLEM - LOW VOLUME PURCHASE OF LSI CHIPS DOES NOT LEND ITSELF TO CIRCUIT VARIATIONS. LARGER THAN NEEDED NUMBERS OF CHIPS MUST BE ORDERED TO GET THE PRODUCER'S ATTENTION. A LOW-VOLUME CHIP CAPABILITY IS NEEDED.

SOLUTION - ANALYZE ALL LSI RESEARCH RESULTS AND SINGLE OUT NEW PROCESSING TECHNIQUES. ESTABLISH A MILITARY CAPTIVE DESIGN AND PRODUCTION LINE. DEVELOP SOFTWARE FOR CAD OF LSI CIRCUITS. PRODUCE VARIATIONS OF SEVERAL CIRCUIT FAMILIES.

(1084) TITLE - ELIMINATE GOLD ON CABLE CONNECTOR PINS

300

PROBLEM - GOLD FLASH OVER NICKEL PLATE IS STANDARD FOR PINS IN MILITARY CONNECTORS. GOLD IS EXPENSIVE AND A SUBSTITUTE IS NEEDED.

SOLUTION - EVALUATE PALLADIUM, TIN-NICKEL, AND NICKEL WITH OR WITHOUT TIN OR INDIUM AS A LUBRICANT. SET UP PULSE PLATING AND OTHER PROCESSES FOR APPLYING THE NEW METALS. COORDINATE WITH AFML.

(1093) TITLE - PRODUCTION METHODS FOR A MILLIMETER MODULAR TRANSPONDER

650 1200 1200

PROBLEM - TRANSPONDERS NOW REQUIRE MUCH HAND FABRICATION LABOR AND ARE HIGH COST. THEY ARE USED ONLY ONCE. THEY MUST RECEIVE A GUIDANCE RADAR SIGNAL, DECODE IT, FORM A CODED REPLY AND TRANSMIT IT TO THE GUIDANCE RADAR. MUST WITHSTAND A HIGH-G ENVIRONMENT.

SOLUTION - REDUCE CONFIGURATION TO A FORM THAT MINIMIZES MFG COST. MODULARIZE TRANSPONDER BY FUNCTION ANTENNA MODULE, RECEIVER MODULE, DECODING MODULE, ENCODING MODULE, TRANSMITTER MODULE, POWER SUPPLY MODULE. BUILD MODULES TO FIT IN A FOUR INCH MI. USE LSI.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- INTEGRATED ELECTRONICS

(CONTINUED)

(1103) TITLE - STABLE MATERIALS & MANUFACTURING FOR MULTILAYER PWB 500

PROBLEM - MATERIAL FAILURE AND INTERLAYER MIS-REGISTRATION IN MULTILAYER CIRCUIT BOARDS INCREASES WITH THINNER BASE LAMINATES. SPECIFICATIONS FOR RAW MATERIALS AND CONTROL ON LAMINATES THAT WILL REDUCE BOARD STRESSES INTRODUCED BY BONDING ARE REQUIRED.

SOLUTION - ESTABLISH A RELATIONSHIP BETWEEN MATERIAL VARIABLES AND DIMENSIONAL STABILITY. APPLY DATA TO FOSTER MATERIALS AND BOARD FABRICATION METHODS THAT REDUCE FREQUENCY OF MISREGISTERED BOARDS AND BOARD FAILURE DUE TO MATERIAL FAILURE.

(3164) TITLE - COMPONENT SIDE PRINTED CIRCUIT BOARD SOLDERING 350

PROBLEM - THERE IS NO KNOWN METHOD FOR HOLDING COMPONENTS IN ALIGNMENT FOR MOUNTING.

SOLUTION - REFINE PROCESS FOR FOIL SIDE MOUNTING OF COMPONENTS TO ACCOMMODATE FLEXIBLE CIRCUITS.

(3263) TITLE - MANF. TECH. FOR PWB UTILIZING LEADLESS COMPONENTS 250 400

PROBLEM - THE VOLUME, WEIGHT, QUANTITY, RELIABILITY AND COST OF PCB'S USING AXIAL LEADED COMPONENTS CAN BE SUBSTANTIALLY IMPROVED.

SOLUTION - USE LEADLESS COMPONENTS CURRENTLY AVAILABLE TO REDUCE THE REQUIRED AREA BY A RATIO OF 2 TO 1 WITH A CORRESPONDING WEIGHT REDUCTION. RELIABILITY MAY BE INCREASED DUE TO A REDUCTION IN THE NUMBER OF PLATED THRU HOLES REQUIRED FOR INTERCONNECTIONS.

(3369) TITLE - UTILIZATION OF LARGE SCALE INTEGRATION (LSI) TECHNIQUES 400

PROBLEM - THE DESIGN AND UTILIZATION OF LSI ELECTRONICS IN AN ADVANCED DEVELOPMENT PROGRAM IS NOT FEASIBLE BECAUSE OF THE INABILITY TO MAKE QUICK CHANGES.

SOLUTION - CONDUCT PROJECT FOR LSI DEVELOPMENT, QUALIFICATION, PRODUCTION ENGINEERING AND PILOT RUN FOR THE STINGER ALTERNATE MISSILE GUIDANCE ELECTRONICS.

(3411) TITLE - MANUFACTURE OF NON PLANAR PRINTED CIRCUIT BOARDS 220 550 738

PROBLEM - USE OF FLAT CIRCUIT BOARDS RESULTS IN COMPLEX AND EXPENSIVE INTERCONNECTIONS WITH LOWERED RELIABILITY.

SOLUTION - DEVELOP THE PROCESSES TO PRODUCE NON-PLANAR CIRCUIT BOARDS SHAPED TO FIT THE AVAILABLE COMPARTMENTS. CIRCUIT PATTERNS WILL BE EXPOSED ON THE INSIDE WITH A PROJECTION MECHANISM OR WITH SOFT X-RAYS. A METHOD OF MASS SOLDERING WILL BE DEVELOPED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- INTEGRATED ELECTRONICS (CONTINUED)

(3415) TITLE - AUTOMATIC PHOTOGRAPHIC PRODUCTION OF THICK FILM MICROCIRCUIT

380 380

PROBLEM - SCREEN PRINTING OF FINE LINES DOES NOT ALLOW HIGH DENSITY DUE TO RHEOLOGY OF ZINC SYSTEMS.

SOLUTION - DEVELOP THICK FILM HYBRID PROCESSING CAPABILITY INCLUDING AUTOMATIC PHOTOLITHOGRAPHIC TECHNIQUES AND ELECTROLYTIC LINE PLATEUP OF FINE LINE THICK FILM CIRCUITS.

COMPONENT -- OPTICS

(1054) TITLE - MFG PROCESS FOR HOLOGRAPHIC OPTICAL COMPONENTS

375

PROBLEM - FABRICATION TECHNIQUES FOR HOLOGRAPHIC OPTICAL COMPONENTS ARE LIMITED TO LAB SAMPLES OF SELECTED OPTICAL COMPONENTS. LIMITATIONS ON SYSTEM PERFORMANCE WHEN THE TECHNOLOGY IS TRANSFERRED FROM THE LAB TO PRODUCTION IS NOT KNOWN.

SOLUTION - ESTABLISH A PILOT PROCESS FOR MAKING HOLOGRAPHIC OPTICAL ELEMENTS WHICH WILL BE USED TO DETERMINE AND OVERCOME THESE LIMITATIONS.

(1069) TITLE - MANUFACTURE OF GRADIENT INDEX LENSES

300 800

PROBLEM - MILITARY OPTICAL SYSTEMS ARE HEAVY, AWKWARD, EXPENSIVE AND DIFFICULT TO MAINTAIN ALIGNMENT. ASPHERIC LENSES HAVE COMPLEX SHAPES REQUIRING SPECIAL POLISHING TECHNIQUES WHICH CAUSE THE LENSES TO BE COSTLY.

SOLUTION - ESTABLISH MANUFACTURING PROCESS FOR THE PRODUCTION OF OPTICAL QUALITY GRADIENT INDEX LENSES.

(1096) TITLE - INFRARED TRANSMITTING HALIDE GLASSES

250 340

PROBLEM - FABRICATION OF INFRARED TRANSMITTING HALIDE GLASSES IS EXPENSIVE AND HAS A LOW YIELD DUE TO THE CRITICAL RESOLUTION REQUIRED. ALSO A PROBLEM EXISTS IN ACCURATELY TEST AND EVALUATE THE OPTICAL ELEMENTS DURING FABRICATION.

SOLUTION - ESTABLISH A HALIDE GLASS IDEAL FOR FIBER OPTIC ELEMENTS, OPTICAL COMPONENTS, AND FARADAY ROTATORS INCLUDING MATERIALS AND PROCESSES AND IMPROVED MEASUREMENT FOR OPTICAL SURFACES.

(3152) TITLE - PRODUCTION OF OPTICAL ELEMENTS (CAM)

300 350

PROBLEM - HIGH GRADE OPTICS IN MODERATE QUANTITY CANNOT BE PRODUCED AT LOW COST WITH REPEATABILITY.

SOLUTION - APPLY COMPUTER CONTROL TO PROCESS OPERATIONS WITH SENSOR CONTROL AND PROCESS FEEDBACK TO ASSURE HIGH YIELD.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- OPTICS (CONTINUED)

(3445) TITLE - PRECISION MACHINING OF OPTICAL ELEMENTS

700 625 403

PROBLEM - EXISTING PRECISION MACHINING FACILITIES CANNOT KEEP UP WITH THE DEMAND, MEET OPTICAL DESIGN REQUIREMENTS, MEET PRODUCTION SCHEDULES, AND STAY WITHIN REASONABLE COST BOUNDARIES.

SOLUTION - INTEGRATE BOTH THE WELL PROVEN ERDA DEVELOPED SINGLE POINT DIAMOND MACHINING CAPABILITIES AND THE DEVELOPING INTERFEROMETRIC AIDED AND COMPUTER CONTROLLED TECHNOLOGY INTO A MANUFACTURING METHOD.

COMPONENT -- SEEKERS

(1053) TITLE - MFG. PROCESS FOR INFRARED FOCAL PLANE ARRAY

550 500

PROBLEM - THE GREATEST OPPORTUNITY FOR FABRICATION OF INFRARED FOCAL PLANE ARRAYS IS TO MATE AN ARRAY OF IR DETECTORS TO A SILICON CHARGE COUPLED DEVICE. HOWEVER PROBLEMS ARE ENCOUNTERED IN ACHIEVING A RELIABLE INTERFACE BETWEEN THE CCD AND ARRAY OF DETECTORS.

SOLUTION - DEVELOP A PROCESS THAT WILL ALLOW AN INDIUM BUMP ON THE BACKSIDE OF EACH ELEMENT OF AN IR ARRAY WHICH CAN BE JOINED IN GOOD ELECTRICAL AND MECHANICAL CONNECTION WITH THE TERMINAL OF AN ELEMENT OF A CCD SIGNAL PROCESSING ARRAY.

(1064) TITLE - PRODUCTION OF INFRARED SEEKER ELECTRONICS USING VLSI (CAM)

400 350

PROBLEM - LOW COST, LIGHT WEIGHT, MINIMUM VOLUME GUIDANCE ELECTRONICS ARE REQUIRED FOR FUTURE FIRE AND FORGET MISSILE SYSTEMS. CURRENT PACKAGING USES DISCRETE COMPONENTS AND HERMETICALLY SEALED ENCLOSURES WITH CIRCUITS ON PC BOARDS ON MOTHERBOARDS IN HOUSINGS.

SOLUTION - USE FOUR OR FIVE STANDARD CHIPS FROM DOD PROGRAM IN VLSI (VERY LARGE SCALE INTEGRATED CIRCUITS) TECHNOLOGY AND DEVELOP MANUFACTURING PROCESSES TO PRODUCE INFRARED IMAGING SEEKER ELECTRONICS USING THIS TECHNOLOGY.

(1083) TITLE - IMP MFG PROC F/FOUR-IN DIAMETER FOCAL PLANE ARRAY SEEKERS

1000 1500 1800

PROBLEM - STARING FOCAL PLANE ARRAY DETECTORS MAKE REDUCTION IN INFRARED SEEKER MECHANICAL COMPLEXITY AND SIZE NOT PREVIOUSLY POSSIBLE. ACHIEVING HIGH PRODUCTION RATE WITH HIGH YIELD IN FABRICATION OF THIS NEW TYPE SEEKERHEAD IS A PROBLEM

SOLUTION - ESTABLISH MANUFACTURING PROCEDURES FOR LARGE VOLUME HIGH YIELD PRODUCTION OF STARING FOCAL PLANE ARRAY DETECTORS AND SMALL DIAMETER SEEKERHEADS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- SEEKERS

(CONTINUED)

(3139) TITLE - MILLIMETER RADIOMETRIC SEEKERS FOR SUBMISSILE APPLICATION

415 750

PROBLEM - LOW QUANTITY PRODUCTION IS TOO COSTLY FOR THE SYSTEM REQUIREMENTS.

SOLUTION - PROVIDE AN ALIGNMENT AND TEST FIXTURE TO SPEED ASSEMBLY AND TEST OF THE SENS-HORN GIMBAL ASSEMBLY. ESTABLISH A METHOD OF MOLDING THE STEPS IN THE LENS. APPLY PHOTOLITHOGRAPHIC TECHNIQUES TO THE XMITTER/RCVR STRUCTURAL ASSEMBLY.

(3186) TITLE - IMPROVED MANUFACTURE OF INFRARED SUBMISSILE SEEKERS

500 671

PROBLEM - LOW YIELD OF SEEKER COMPONENTS IS DUE TO HANDLING AND CHECKOUT OF GYRO OPTICS.

SOLUTION - PROVIDE LOWER COST SPHERICAL ELEMENTS TO REPLACE THE ASPHERICS. PROVIDE A FIBER OPTIC CUTTING METHOD THAT WILL ELIMINATE THE NEED TO POLISH THE FIBER INDS. OPTIMIZE THE FIBER OPTIC MATERIALS TO EXTEND THE OPERATING RANGE TO LONGER WAVELENGTHS.

(3428) TITLE - IMPROVED TECHNIQUES FOR COMMON APERTURE MULTISPECTRUM SEEKER

259 350

PROBLEM - PRESENT METHODS FOR MAKING WIDE BAND ON A ONE AT A TIME BASIS, DOES NOT PERMIT GOOD CONTROL OF PERFORMANCE.

SOLUTION - MANUFACTURING TECHNIQUES ARE REQUIRED TO PRODUCE THESE COMPONENTS IN MODERATE QUANTITIES WITH CLOSER TOLERANCES.

COMPONENT -- SENSORS

(1079) TITLE - WIDE AREA MERCURY-CADMIUM-TELETRIDE QUADRENT DETECTORS

300

PROBLEM - LARGE AREA MERCURY-CADMIUM-TELLURIDE QUADRENT DETECTORS FOR IR SEEKERS ARE EXPENSIVE BECAUSE OF HIGH MATERIAL COST AND LOW YIELD. THE MATERIAL IS HARD TO GROW TO THE RIGHT CHEMICAL BALANCE. SLICING, ION IMPLANTATION AND/OR DIFFUSION ARE TOUCHY.

SOLUTION - FIND THE EXACT CHEMISTRY FOR GOOD DETECTOR OUTPUT. LOOK AT CLOSED LOOP COMPUTER CONTROL OF CRYSTAL PULLING. OPTIMIZE X-RAY CHARACTERIZATION, SAWING, POLISHING, ION IMPLANTATION, AND TESTING.

(1090) TITLE - ION IMPLANTED THIN FILM TRANSISTORS

350

PROBLEM - PROCESSES FOR MANUFACTURING THIN FILM TRANSISTORS PRODUCE INCONSISTENT RESULTS DUE TO INABILITY TO CONTROL THE GEOMETRIES AND ELECTRICAL PROPERTIES OF THE MATERIAL.

SOLUTION - ESTABLISH ION IMPLANT TECHNOLOGY APPLICABLE TO THE DESIGN AND FABRICATION OF THIN FILM ACTIVE DEVICES.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- SENSORS

(CONTINUED)

(1094) TITLE - PROD METH F/MILLIMTR MONOPULSE ANTENNA F/DIR FIRE APPL 1190 1190

PROBLEM - SENSOR ANTENNA SYSTEM NEEDS RELATIVE ALIGNMENT FACTORS BETWEEN DIELECTRIC LENS, MOVABLE REFLECTOR AND ACTIVE ANTENNA ELEMENT REQUIRING ANTENNA FEED UNITS BUILT BY HAND.

SOLUTION - ESTABLISH METHODOLOGY FOR CONSTRUCTING MONOPULSE ANTENNA INTO A COMPATIBLE PACKAGE WITH A 5 MILLIRADIAN BEAM WIDTH AT 94 GHZ.

(1098) TITLE - LARGE DIAMETER SILICON 160

PROBLEM - MILITARY REQUIREMENTS FOR DETECTORS ARE EXCEEDING STANDARD SIZES. SPECIAL TOOLING AND REPLACEMENT PARTS CREATE A PREMIUM ON COST AND TIME DELAYS.

SOLUTION - INVESTIGATE ETCHING, ULTRASONIC CAVITATION, LASER SCRIBING, SAWING AND TREPPANNING FOR CUTTING .8 IN DISCS FROM 3 IN WAFERS. REDUCE STRESS AND PREVENT FAILURES.

(1099) TITLE - MFG METH AND TECH F/PIN DIODES AT MILLIMETER WAVE FREQUENCY 368

PROBLEM - CURRENT MANUFACTURE TECHNIQUES FOR DIODES ARE LIMITED BY WAFER SIZE AND BONDING. OTHER PROBLEMS INCLUDE METAL SYSTEMS WITH BONDING AND ETCHING, SAWING, LAPPING AND POLISHING FOR PRECISE DIMENSIONS.

SOLUTION - ESTABLISH METHODS FOR WAFER SAWING, STACKING AND BONDING, AND FOR STACK SAWING, LAPPING, AND POLISHING IN ORDER TO OBTAIN A THREE DIMENSIONAL DIODE STRUCTURE. THEN FIT AND ATTACH POLISHED STACKS TO WAVEGUIDE WALL. ALSO SET UP A HIGH TEMP METAL SYST.

(1100) TITLE - HIGH PERFORMANCE MMW IMPATTS USING THIN SILICON 250 340

PROBLEM - COST AND PERFORMANCE OF MILLIMETER WAVE (MMW) IMPATT DIODES HAVE POOR REPRODUCIBILITY RESULTING IN LOW DEVICE YIELDS.

SOLUTION - ESTABLISH METHODOLOGY THINNING SILICON TO LESS THAN 10 MICRONS AND DOPING CONTROLS UTILIZING LOW TEMPERATURE PROCESSES.

(1104) TITLE - IMPROVED SANDWICH DETECTOR FABRICATION FOR INFRARED SEEKERS 500 500

PROBLEM - FABRICATING TWO DETECTORS INTO A SANDWICH CAUSES LOWER SENSITIVITY, CROSS TALK, POOR TRANSMISSION, AND PROVIDES A DETECTOR TO THICK FOR A COMMON FOCUS.

SOLUTION - ESTABLISH METHODOLOGY FOR PRODUCING DETECTOR OPERATING IN TWO SPECTRAL BANDS FROM ONE PIECE OF MATERIAL.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- SENSORS

(CONTINUED)

(3177) TITLE - IMPROVED MANF. PROCESS FOR SUBMISSILE ELECTRONIC SUBSYSTEM

PROBLEM - PRESENT MANUFACTURING PROCESSES SUBSTANTIALLY INCREASE THE COST OF HOMING SUBSYSTEMS.

SOLUTION - INVESTIGATE VOLUME METHODS FOR PRODUCING ELECTRONIC HOMING SUBSYSTEMS.

250 375

(3277) TITLE - AUTOMATIC INERTIAL SENSOR FABRICATION

PROBLEM - INERTIAL SENSOR FABRICATION REQUIRES PRECISION MACHINING AND ASSEMBLY METHODS WITH SEVERAL ITERATIONS, ALL OF WHICH INCREASE COST.

SOLUTION - ESTABLISH AUTOMATIC FLUID FILL STATION AND SET UP PILOT STATION FOR AUTOMATIC BALANCING OF GYRO ROTORS BY LASER REMOVAL OF MATERIAL

350 350

COMPONENT -- WINDOWS/RADOMES

(1042) TITLE - PRODUCTION OF COMPOSITE RADOME STRUCTURES

755

PROBLEM - THE BASIC MATERIAL FOR COMPOSITE RADOMES IS EXPENSIVE (\$25/LB). THE FABRICATION PROCEDURES FOR PRODUCING THE RADOME STRUCTURE ARE COMPLEX AND EXPENSIVE, WITH SOME PROCEDURES BEING PROPRIETARY.

SOLUTION - ESTABLISH FIBERGLASS REINFORCED TEFLON AS A REPLACEMENT FOR THE CURRENT DUAL WALL BONDED PROPRIETARY MATERIAL (DURVOID). OPTIMUM PROCESSING WILL BE SELECTED BASED ON MECHANICAL PROPERTIES AND SLED TEST RESULTS AND WILL BE SCALED UP.

(1068) TITLE - IMPROVED FABRICATION OF DOME RADAR MODULES

495 370

PROBLEM - DOME PHASED ARRAY RADARS TYPICALLY REQUIRE 25,000 RADIATING ELEMENTS PER SYSTEM. MANUFACTURING PROCESSES ARE NEEDED TO ASSEMBLE THESE ELEMENTS INTO STANDARD CLUSTERS (MODULES) WHICH WILL BE USED AS THE BASIC BUILDING BLOCK FOR THE DOME RADAR SYS.

SOLUTION - MANUFACTURING TECHNIQUES INCLUDING ETCHING, PUNCHING, MOLDING AND FORMING WILL BE ESTABLISHED FOR STRIPLINE CIRCUITS AND GROUND PLANES. SOFTWARE WILL BE DEVELOPED FOR NUMERICAL CONTROLLED PLANAR PRINTING, ETCHING, MASK PUNCHING AND TESTING.

(1108) TITLE - RF AND LASER HARDENING OF MISSILE DOMES

440 421

PROBLEM - CURRENT RADOMES ARE SUSCEPTIBLE TO DAMAGE BY LASER ENERGY AND ALSO PERMIT LASER AND RADIO FREQUENCY ENERGY TO DAMAGE THE DETECTOR.

SOLUTION - DEVELOP RF SPUTTERING METHODS TO APPLY INDIUM OXIDE, TIN OXIDE AND ANOTHER MATERIAL TO THE INSIDE OF THE GLASS OR PLASTIC RADOME. USE COATINGS THAT PASS ONLY .8 TO 1.5 MICRON WAVELENGTHS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- WINDOWS/RADOMES

(CONTINUED)

(3176) TITLE - MANUFACTURE OF SILICON NITRIDE RADOMES

390 350

PROBLEM - THERE IS NO EXISTING ECONOMICAL MANUFACTURING PROCESSES FOR LARGE RADOMES FROM CURRENT MATERIALS.

SOLUTION - SLIPCAST SILICON POWDER AND FIRE THE RADOME IN A NITROGEN ATMOSPHERE.

(3426) TITLE - IMPROVED PROCESSES FOR MIRRORS AND WINDOWS FOR HE LASERS

300

PROBLEM - MIRRORS AND WINDOWS FOR HIGH ENERGY LASER APPLICATION ARE EXPENSIVE TO FABRICATE AND HAVE POOR REPRODUCIBILITY.

SOLUTION - ESTABLISH METHODS FOR PRODUCING MODERATE QUANTITIES OF MIRRORS AND WINDOWS AT LOWER COST AND GREATER UNIFORMITY.

(3432) TITLE - IMPROVED IN DOME MATERIALS

500

PROBLEM - THE CURRENT PROCESS FOR THE PRODUCTION OF SILICON NITRIDE, A BATCH PROCESS, STARTS WITH HIGH PURITY SILICON AND TAKES PLACE AT 1400 C IN AN OXYGEN FREE ATMOSPHERE FOR SEVERAL DAYS.

SOLUTION - THE PROPOSED PROCESS, RECENTLY DEVELOPED A AMMRC, USES LOW GRADE FERRO-SILICON AND OPERATES AT 1100-1250 C IN A CONTINUOUS PROCESS. THE MATERIAL PRODUCED IS EQUAL TO CURRENTLY PRODUCED SILICON NITRIDE.

* C A T E G O R Y *

*MISSILE STRUCTURE *

COMPONENT -- AIRFRAMES-COMPOSITES

(1020) TITLE - MFG PROCESSES FOR FUSED SILICA FIBERS

700

PROBLEM - THERE IS NO COMMERCIAL SOURCE FOR HIGH PURITY FUSED SILICA FIBERS.

SOLUTION - SCALE-UP PROCEDURES USED FOR FIBER OPTICS APPLICATIONS AND SET UP A PILOT PRODUCTION LINE TO PRODUCE FUSED FIBERS OF STRUCTURAL QUALITY

(1026) TITLE - LO-COST MFG TECHNIQUES FOR HI PRODUCTION MISSILE VANES (CAM)

305 360

PROBLEM - METAL CONTROL VANES, FINS AND MISSILE FAIRINGS CAUSE HIGH COST, WEIGHT PENALTIES AND LONG LEAD TIME

SOLUTION - AUTOMATION OF COMPOSITE MATERIALS OFFER AN OPPORTUNITY TO MEET LOW COST, WEIGHT, AND PRODUCTION CRITERIA. EFFORT PROVIDES FOR AUTOMATION OF PRE-ENGINEERED BROADGOOD ON AN W/C TAPE LAYING MACHINE.

COMPONENT -- AIRFRAMES-COMPOSITES

(CONTINUED)

(1080) TITLE - LOW COST CARBON/CARBON NOSETIPS

PROBLEM - THE WEAVING PROCESS TO FABRICATE CARBON/CARBON NOSETIP PREFORMS IS LABOR INTENSIVE BECAUSE OF THE FINEWEAVE CENTER-TO-CENTER YARN SPACINGS. IN ADDITION, PREFORMS USE EXPENSIVE GRAPHITE YARN AND REQUIRE LONG IMPREGNATION CYCLES.

SOLUTION - DEVELOP OPTIMAL FABRICATING PROCEDURES FROM LOWER COST MATERIALS, PITCH RESIN AND T-300 CARBON FIBERS. UTILIZATION OF SHORTER DENSIFICATION CYCLES PREFORMS, AND FIBER SPACINGS WILL PROVIDE THE MEANS FOR REDUCING CYCLE TIMES.

(1082) TITLE - HIGH ANGLE TAPE WRAPPED HEATSHIELDS

PROBLEM - DATA HAS SHOWN THAT THE EROSION PERFORMANCE OF TAPE WRAPPED HEATSHIELDS IMPROVES AS THE SHINGLE ANGLE INCREASES ABOVE 30 DEGREES. CURRENT MFG TECHNIQUES DO NOT LEND THEMSELVES TO HIGH WRAP-ANGLE HEATSHIELDS.

SOLUTION - DEVELOP IMPROVED WRAPPING TECHNIQUES TO CURRENT TAPE WRAPPING EQUIPMENT AND PROCESSING TECHNOLOGY.

COMPONENT -- COMPONENTS

(1073) TITLE - REAL TIME ULTRASONIC IMAGING

PROBLEM - EXISTING ACOUSTICAL HOLOGRAPHY INSP. SYS PRODUCES UNSATISFACTORY VIDEO IMAGES DUE TO POOR RESOLUTION, SIGNAL NOISE AND LOW SPATIAL FREQ. ABERRATIONS.

SOLUTION - A 3 CHANNEL PIPELINE PROCESSOR WITH ASSOCIATED 512X512X8 MEMORIES WITH A 30 FRAMES/SEC DISPLAY CAPABILITY. THIS SYS WOULD ELIMINATE ABERRATION, IMPROVE CONTRAST, AND REDUCE SIGNAL NOISE.

(3288) TITLE - MANUFACTURING TECHNOLOGY FOR DIE CASTING

PROBLEM - WEIGHT AND SPACE CONSTRAINTS HAVE RESULTED IN COMPLEX AND HIGH DENSITY CONFIGURATIONS OF METAL PARTS WHICH ARE MACHINED.

SOLUTION - ESTABLISH AND PROVE-OUT DIE CASTING TECHNIQUES FOR THESE COMPLEX CONFIGURATION.

COMPONENT -- FORMING

(3282) TITLE - CONFORM EXTRUSION PROCESS

PROBLEM - CONSIDERABLE COSTS ARE INCURRED IN TRANSPORTATION, DAMAGE AND LOSS OF SEMI-FINISHED PARTS.

SOLUTION - REVIEW MISSILE PARTS AND DETERMINE IF THEY CAN BE PRODUCED BY CONFORM PROCESS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MACHINING

(1021) TITLE - COMPUTERIZED PROD PROC PLAN FOR MACH CYLINDRICAL PARTS (CAM) 240 234

PROBLEM - PRESENT MANUAL METHOD FOR PRODUCTION PROCESS PLANNING OF MACHINED CYLINDRICAL METAL COMPONENTS ARE INADEQUATE DUE TO HIGH PROCESS PLANNING COSTS AND A LACK OF STANDARDIZATION.

SOLUTION - DEVELOP A COMPUTER SOFTWARE SYSTEM FOR PROCESS PLANNING OF MACHINED CYLINDRICAL PARTS. THE SYSTEM WILL BE MANUFACTURER-INDEPENDENT AND WILL INCORPORATE PROCESS DECISION MODELING.

* C A T E G O R Y *

*PROPULSION SYSTEM *

COMPONENT -- MOTOR CASES

(1088) TITLE - OPTIMIZED MANDREL FAB AND UTILIZATION F/COMP MOTOR CASES 700 481 400

PROBLEM - OPTIMIZING PRODUCTION PROCEDURES TO OBTAIN LOWEST UNIT COST WHILE MAINTAINING RELIABILITY IN FABRICATION.

SOLUTION - ESTABLISH PRODUCTION PROCEDURES AND PRODUCTION RATES FOR MANDREL FABRICATION. THIS WILL PROVIDE PRODUCTION ENGINEERING DATA ESSENTIAL TO CURRENT AND FUTURE MOTOR COMPONENT REQUIREMENTS.

(1089) TITLE - INTEGRAL ROCKET MOTOR COMPOSITE POLE PIECES AND ATTACHMENTS 350 350

PROBLEM - CURRENT FILAMENT WOUND COMPOSITE ROCKET MOTOR CASES REQUIRE FORGED METAL POLE PIECES, NOZZLE CLOSURE ATTACHMENT RINGS, AND OTHER ATTACHMENT RINGS. THESE COMPONENTS ARE EXPENSIVE, AND REQUIRE LONG LEAD TIME PROCUREMENT.

SOLUTION - ESTABLISH A FILAMENT WINDING PRODUCTION PROCESS FOR FABRICATING COMPOSITE MOTOR CASES WITH INTEGRAL POLE PIECES, AFT ATTACHMENT RINGS, AND FORWARD AND AFT DOME SECTIONS.

(3294) TITLE - PRODUCTION PROCESS FOR ROTARY ROLL FORMING 300 159

PROBLEM - MECHANICALLY JOINING OR WELDING A CONVENTIONAL CLOSURE TO COMMERCIAL TUBING IS EXPENSIVE.

SOLUTION - DEVELOP METHODS FOR PRODUCING INTEGRAL NOZZLES WITH TUBULAR PRODUCTS USING ROTARY ROLL FORMING TECHNIQUES.

COMPONENT -- MOTOR CASES (CONTINUED)

(3419) TITLE - THERMOMECHANICAL METHODS FOR HIGH STRENGTH STL RKT MTR CASES 500

PROBLEM - THE MANUFACTURING PROCESSES FOR HIGH STRENGTH ROCKET MOTOR CASES FOR THE MLRS (FORMERLY GSRs) RESULT IN A RESIDUAL STRESS PATTERN (RADIAL) THAT DOES NOT TAKE FULL ADVANTAGE OF THE MATERIAL PROPERTIES.

SOLUTION - THIS PROGRAM WOULD DEVELOP AUTOMATED PROCEDURES TO PERFORM THERMO-MECHANICAL FABRICATION OF THE STEEL MOTOR CASES. THIS PROCESS WILL PRODUCE A MORE DESIRABLE STRESS PATTERN FOR INCREASED PERFORMANCE.

COMPONENT -- MOTOR COMPONENTS

(1036) TITLE - PRODUCTION METHODS FOR VSTT TURBINE ROTORS 400

PROBLEM - TURBINE ROTORS ARE SUBJECT TO STRESS AND FATIGUE LEVELS AS ENGINE THRUST INCREASES.

SOLUTION - IMPLEMENT PILOT PRODUCTION PROGRAM TO ESTABLISH COST EFFECTIVE PRODUCTION AND TEST TECHNIQUES TO FABRICATE TURBINE ROTORS WITH INCREASED STRESS AND FATIGUE LEVELS.

(1050) TITLE - LOW COST BRAIDED ROCKET MOTOR COMPONENTS 430 481

PROBLEM - ROCKET MOTOR COSTS TO MEET DESIGN-TO-COST PRODUCTION GOALS HAVE DICTATED REEVALUATION OF MATERIALS AND PROCESSES. MISSILE CASES COMPRISE 1/2 OF PROPULSION SYSTEM COST. EMPHASIS MUST BE PLACED ON ESTABLISHING NEW COMPONENT MFG PROCESSES.

SOLUTION - OPTIMIZE THE PRODUCTION PROCEDURES AND RATES FOR INTEGRALLY BRAIDED CASE/NOZZLE COMPONENTS TO PROVIDE PRODUCTION ENGINEERING DATA ESSENTIAL TO FUTURE MOTOR COMPONENT REQUIREMENTS.

(1051) TITLE - REPLACEMENT OF ASBESTOS IN ROCKET MOTOR INSULATIONS 475 572

PROBLEM - PRESENT ASBESTOS CONTAINING INSULATORS CAN NO LONGER BE MANUFACTURED AFTER 1981 DUE ITS BEING IDENTIFIED AS A CARCINOGEN. THUS THE GOVT HAS LOST THE CAPABILITY OF USING INSULATING MATERIALS THAT HAS PROVEN TO BE AN EXCELLENT THERMAL BARRIER.

SOLUTION - FILLER MATERIALS OTHER THAN ASBESTOS ARE AVAILABLE. FIBER GLASS AND SILICA HAVE BEEN USED IN SPECIALIZED APPLICATIONS AND WOLLASTONITE LOOKS PROMISING. MATERIALS SPECS AND MOTOR TEST VERIFICATION MUST BE DONE BEFORE A SUBSTITUTE MATERIAL CAN BE USED.

(1086) TITLE - COBALT REPLACEMENT IN MARAGING STEEL F/ROCKET MOTOR COMP 300 517 430

PROBLEM - CURRENT HIGH PERFORMANCE ROCKET MOTOR COMPONENTS UTILIZE MARAGING STEELS IN LARGE QUANTITIES. COBALT, ONE OF THE KEY INGREDIENTS COMES FROM POLITICALLY SENSITIVE AREAS AND IS BECOMING DIFFICULT TO OBTAIN.

SOLUTION - OPTIMIZE MILL PROCEDURES AND EVALUATE IN A ROCKET MOTOR THE NEW COBALT FREE MARAGING STEEL ALLOYS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

(CONTINUED)

COMPONENT -- MOTOR COMPONENTS

(1087) TITLE - APPLICATION OF COMMERCIAL GRADE KEVLAR TO ROCKET MOTOR COMP

500

PROBLEM - CURRENT MILITARY ROCKET MOTOR COMPONENTS USE KEVLAR 49 FIBER IN LARGE QUANTITIES. THIS AEROSPACE GRADE IS VERY COSTLY.

SOLUTION - OPTIMIZE MILL PROCEDURES AND MOTOR COMPONENT PROCESSING METHODOLOGY FOR COMMERCIAL GRADE KEVLAR AND EVALUATE THE PERFORMANCE IN A ROCKET MOTOR COMPONENT ENVIRONMENT

COMPONENT -- NOZZLES

(3423) TITLE - LOW COST/HIGH PERFORMANCE FIBROUS GRAPHITE ROCKET NOZZLES

300 602

PROBLEM - ROCKET SYSTEMS USING HIGH PERFORMANCE CARBON/CARBON OR PYROLYTIC GRAPHITE NOZZLES INCUR HIGH COMPONENT COST.

SOLUTION - THIS PROJECT WILL SCALE UP THE FIBROUS GRAPHITE PROCESS TO MAKE FULL-SCALE NOZZLE COMPONENTS AND WILL EXTEND NOZZLE TEST DATA.

COMPONENT -- PROPELLANTS

(1035) TITLE - DEMONSTRATION OF LOW COST CARBONATE MODIFIER

750

PROBLEM - NHC IS USED AS A BALLISTIC MODIFIER FOR SOLID ROCKET PROPELLANTS BUT IS VERY EXPENSIVE DUE TO A LOW YIELD PROCESS.

SOLUTION - INVESTIGATE ALKYNE PROCESS FOR PRODUCTION OF NHC TO REDUCE NET PRODUCT COST.

(1037) TITLE - LOW COST EXTRUDABLE PYROTECHNIC PELLETING PROCESS

650

PROBLEM - PELLETING OPERATION IS A FUNCTION OF PELLET SIZE, THE SMALLER THE PELLET THE GREATER THE COST.

SOLUTION - DEVELOP EXTRUDABLE COMPOSITIONS WITH THE SAME IGNITION CHARACTERISTICS AS PELLETS. DESIGN CONTINUOUS OPERATION TO PRODUCE VARIOUS SIZED PELLETS.

(1038) TITLE - PROD OF NITRO POLYMERS FOR SMOKELESS PROPELLANTS

650

PROBLEM - NITROCELLULOSE PLASTICIZER BINDER HAS A VERY LIMITED FLEXIBILITY FOR FORMULATION OF SMOKELESS PROPELLANT COMPOSITIONS.

SOLUTION - MAKE PRODUCTION OF POLYETHYLENE GLYCOL NITRAMINE POLYMER COMMERCIALY AVAILABLE.

COMPONENT -- PROPELLANTS

(CONTINUED)

(1044) TITLE - CONTINUOUS PROCESS FOR PROPELLANT MANUFACTURE

50 1477

PROBLEM - PROPELLANT MANUFACTURE IS GENERALLY A BATCH PROCESS WITH INHERENT PROBLEMS. CURE ACCELERATORS MUST BE AVOIDED SINCE THEY SHORTEN POT LIFE. THE PROCESS HAS HIGH LABOR REQUIREMENTS. HIGH VISCOSITIES RESULT IN DISCARDING THE BATCH.

SOLUTION - A CONTINUOUS MIXING AND MOTOR LOADING PROCESS WILL REDUCE PRODUCTION LABOR AND FACILITIES, AND IMPROVE PROPELLANT QUALITY AND RELIABILITY. SAFETY PROBLEMS RELATED TO QUANTITY DISTANCES CAN BE MINIMIZED.

(3317) TITLE - CASTING OF PROPELLANTS

350

PROBLEM - THE END BURNING SUSTAINER GRAIN FOR STINGER IS PRESENTLY CAST AND CURED, MACHINED, INHIBITED WITH BOOT WHICH IS BONDED TO EXTERIOR OF GRAIN.

SOLUTION - DEVELOP CAST-IN-BOOT PROCESS TO CAST GRAIN DIRECTLY INTO INHIBITOR BOOT.

(3320) TITLE - NON-DESTRUCTIVE TESTING (NDT) OF PROPELLANTS

275

PROBLEM - THE FULL COMPLEMENT ON NDT TEST BY CURRENT METHODS IS TOO EXPENSIVE TO BE USED.

SOLUTION - DEVELOP A COMPUTERIZED SYSTEM FOR THE ASSESSMENT OF NDT DATA.

(3404) TITLE - MANUFACTURE OF ULTRAFINE AMMONIUM PERCHLORATE

475

475

PROBLEM - BURNING RATES OF SPECIFIC SYSTEMS WILL OFTEN BE OUT OF SPECIFICATIONS BECAUSE OF THE UFAP MANUFACTURE AND REPRODUCIBILITY PROBLEMS.

SOLUTION - THIS PROJECT WILL ESTABLISH A REPRODUCABLE METHOD OF GRINDING UFAP, EVALUATE THE QUALITY AND REPRODUCIBILITY IN HIGH RATE COMPOSITE PROPELLANT FORMULATIONS AND ESTABLISH QUALITY CONTROL AND PROCESS SPECIFICATIONS.

(3447) TITLE - SCALE UP AND DEMO FOR THE RECOV OF CARBORANE FROM WASTE PROP

375

PROBLEM - THE PRODUCTION OF N-HEXYLCARBORANE (NHC) RESULTS IN UP TO 10 PCT REJECTED MATERIAL BECAUSE IT WILL NOT MEET BALLISTIC RATE REQUIREMENTS.

SOLUTION - THE SCRAP PROPELLANT CAN BE DISSOLVED IN PENTANE, DRIED AND DISTILLED TO PURIFY IT. THE NHC THAT WOULD BE SCRAPPED IS THUS RECOVERABLE. THIS PROJECT WILL SCALE UP THE LABORATORY PROCESS SUCH THAT THE TOTAL PROCESS CAN BE DEMONSTRATED.

(3448) TITLE - RECOVERY OF DIBORANE IN THE MANUFACTURE OF NHC

440

PROBLEM - THERE IS AN 8% LOSS OF UNREACTED DIBORANE FROM THE PROCESS USED TO PRODUCE NHC

SOLUTION - RECOVER AND RECYCLE THE DIBORANE WITH A DIMETHYL-ZINC CHLORIDE PROCESS

FUNDING (\$000)

PRIOR 81 82 83 84 85

(CONTINUED)

COMPONENT -- PROPELLANTS

(3449) TITLE - OPTIONAL PROPELLANT INGREDIENTS

250 431

PROBLEM - A NUMBER OF CHEMICAL INGREDIENTS USED IN SOLID ROCKET PROPELLANTS HAVE BECOME UNAVAILABLE BECAUSE SOME OF THE REAGENTS ARE HAZARDOUS.

SOLUTION - STUDIES SHOW THAT ISOPHRONONE DIISOCYANATE (IPDI) CAN BE MADE IN A BATCH PROCESS WITHOUT USING PHOSGENE. THIS LABORATORY PROCESS WILL BE SCALED UP.

(3450) TITLE - SCALE UP & DEMONSTRATION OF A PROCESS FOR DIBORANE

950

PROBLEM - THE PRESENT PROCESS IS A BATCH OPERATION AND BECAUSE OF THE DIFFICULTY IN CONTROLLING THE CHEMISTRY THE BATCHES ARE SMALL RESULTING IN HIGH LABOR COSTS.

SOLUTION - IT IS ESTIMATED THAT DIBORANE CAN BE PRODUCED USING INEXPENSIVE RAW MATERIALS- BORIC ACID, METHANOL AND SODIUM HYDRIDE IN A SIMPLE CONTINUOUS PROCESS THAT IS EASILY CONTROLLED. A PILOT FACILITY WILL BE BUILT TO DEVELOP THE PROCESSES.

* C A T E G O R Y *

*TEST EQUIPMENT *

COMPONENT -- ELECTRICAL TEST EQUIPMENT

(3115) TITLE - ENGINEERING FOR CALIBRATION EQUIPMENT

3787 661 800 800 800

PROBLEM - MEASUREMENT SCIENCES OR METROLOGY MUST BE CONTINUALLY ADVANCED IN RELEVANT TECHNOLOGY AREAS TO KEEP PACE WITH MANY ARMY PROGRAMS.

SOLUTION - ADVANCEMENTS MUST BE MADE BY DERIVING NEW TYPES OF STANDARDS.

COMPONENT -- ELECTRONIC COMPONENTS

(1060) TITLE - ELECTRICAL TEST AND SCREENING OF CHIPS

375 451

PROBLEM - ONE UNRELIABLE CHIP IN MILITARY ELECTRONIC ASSEMBLIES CAUSES REJECTION OR DESTRUCTION OF THE ENTIRE PACKAGE. PRESENT MEANS FOR DETERMINING CHIP RELIABILITY OR INTEGRITY IS A PROBE TESTING TECHNIQUE WHICH IS TIME CONSUMING AND DESTRUCTIVE.

SOLUTION - PLACE A MONOLITHIC CHIP TESTING DEVICE AT THE POINT JUST BEFORE THE CHIP IS BONDED TO THE SUBSTRATE. INCLUDE ON THE PROBE A NON-DESTRUCTIVE POINT AND A METHOD FOR OXIDE REMOVAL.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- ELECTRONIC COMPONENTS

(CONTINUED)

(1076) TITLE - AUTOMATIC RECOGNITION OF CHIPS

PROBLEM - INABILITY TO RECOGNIZE THE TOPOGRAPHY OF MORE THAN SIX TO SEVEN CHIPS ON A HYBRID SUBSTRATE. MILITARY HYBRID CIRCUITS CARRY TEN TO FIFTEEN TYPE ACTIVE COMPONENTS.

SOLUTION - MODIFY EXISTING OPTICAL PATTERN RECOGNITION EQUIPMENT FOR COMPONENT AND BOND PAD ALIGNMENT TO RECOGNIZE AN AVERAGE 30 TO 35 DIFFERENT DEVICES PER SUBSTRATE.

550 481 430

(1092) TITLE - AUTOMATIC TESTING OF SUBSTRATES

PROBLEM - MULTILAYER HYBRID SUBSTRATE TEST METHODS ARE MECHANICAL, USING A MICROFINE PROBE. THE TEST METHOD IS TECHNICALLY DIFFICULT, TIME CONSUMING AND CONTRIBUTES TO YIELD LOSS.

SOLUTION - ESTABLISH A PROCESS USING AN ELECTRON BEAM SCANNER. USE COMPUTER-AIDED DEVICES AND A COMPLETE SCANNING SYSTEM WITH A DEFECT LIBRARY DEVELOPED TO INCREASE YIELD IN SUBSTRATE FABRICATION.

250

(3251) TITLE - HIGH TEMPERATURE OPERATING TESTS FOR MICROCIRCUITS

PROBLEM - LIFE TESTS ON SEMICONDUCTOR DEVICES ARE IMPRACTICAL DUE TO THE HUNDREDS OF THOUSANDS OF TEST HOURS REQUIRED.

SOLUTION - IMPLEMENT HIGH TEMPERATURE OPERATING TESTS AS EARLY IN THE MANUFACTURING CYCLE AS FEASIBLE.

490 490

(3322) TITLE - INFRARED ELEMENT TESTING

PROBLEM - IR SYSTEM OPTICAL ELEMENTS ARE SPECIFIED IN TERMS OF MIL-0-13830 WHICH REQUIRES SUBJECTIVE JUDGEMENT.

SOLUTION - ESTABLISH A SUPPLEMENT TO MIL-0-13830, OPTICAL DESIGN GUIDANCE FOR FUNCTION TESTING, STANDARD TESTS AND EQUIPMENT.

150 200

COMPONENT -- GENERAL

(1052) TITLE - ACOUSTIC EMISSION OF MOTOR CASE WELD FABRICATION

PROBLEM - FABRICATION OF ROCKET MOTOR CASES BY ROLL AND WELD PROCESS IS UNATTRACTIVE BECAUSE OF HIGH COST FROM EXTENSIVE NON-DESTRUCTIVE INSPECTION TECHNIQUES REQUIRED. A TECHNIQUE IS TO DETECT DEFECTS AS THEY FORM THUS PERMITTING IMMEDIATE REPAIR.

SOLUTION - DEVELOP AN ON-LINE, REAL TIME ACOUSTIC EMISSION WELD MONITORING TECHNIQUE. THIS PROJECT WILL EXTEND THE RESULTS OF AN MTT PROJECT TO THE FULL PRODUCTION CONFIGURATION.

300

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(CONTINUED)

(1074) TITLE - CHEMICAL CHARACTERIZATION BY SPECTROSCOPY

200

PROBLEM - INFRARED ANALYSIS OF COMPOSITE RESIN CONSTITUENTS SEPARATED BY HIGH PRESSURE LIQUID CHROMATOGRAPHY (HPLC) IS LABOR INTENSIVE, AND THUS EXPENSIVE.

SOLUTION - AUTOMATE THE COLLECTION, PREPARATION, AND INFRARED ANALYSIS OF RESIN CONSTITUENTS SEPARATED BY HPLC.

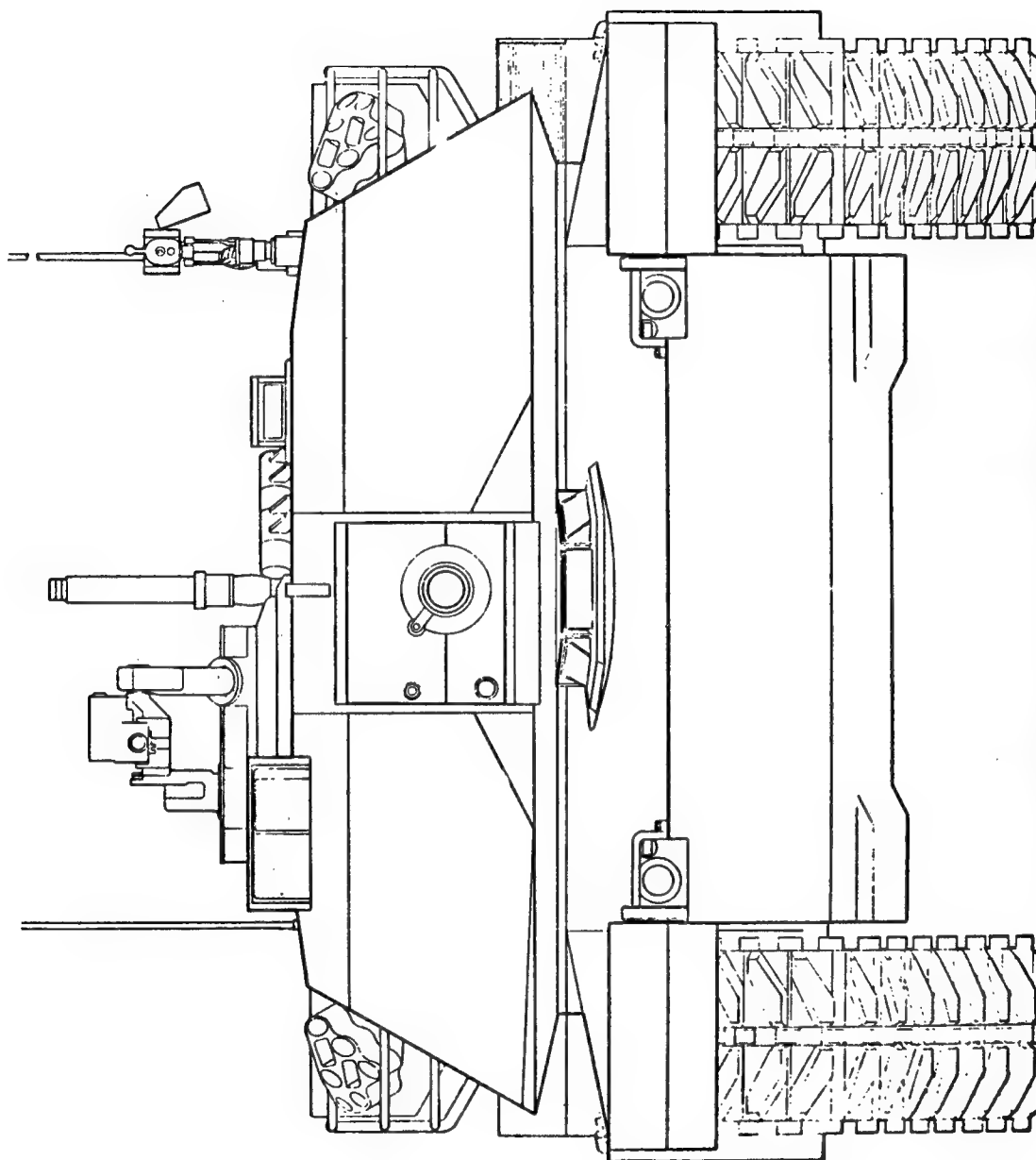
COMPONENT -- X-RAY AND N-RAY

(3241) TITLE - AUTOMATIC X-RAY READER TEST EQUIPMENT FOR 3D X-RAYS

552

PROBLEM - X-RAY IS LIMITED TO A TWO DIMENSIONAL FORMAT AND IS DEPENDENT ON THE TRAINING AND JUDGEMENT OF THE INSPECTOR.

SOLUTION - AUTOMATE THE ANALYSIS OF X-RAY RESULTS, AND PROVIDE DEPTH PERSPECTIVE BY PARALLEL OR HOLOGRAPHIC TECHNIQUES



**TANK-AUTOMOTIVE COMMAND
(TACOM)**

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US ARMY TANK-AUTOMOTIVE COMMAND

(TACOM)

The US Army Tank and Automotive Command is located in Warren, MI, and has the mission of developing, acquiring, and fielding tracked and wheeled military combat, tactical, and general purpose vehicles. The mission is worldwide in scope and includes among its customers all of the US military services, and friendly foreign nations. The production base for mission items is made up of both private and government-owned contractor-operated facilities. MMT efforts are accomplished partially in-house and partially out-of-house. The TACOM MMT program is separated into six categories: armor, general, drive system, track, suspension, and vehicle body.

The main requirements in the field of armor are to increase the ballistic tolerance of conventional armor while reducing its overall weight, and develop new lightweight armor for the high speed, high survivability vehicles which are currently being evaluated in field tests. To meet these requirements, the Command is emphasizing Electro-Slag Remelt (ESR) steel armor, combination type armor and the application of spall suppressive armor to the interior walls of combat vehicles to reduce the overall ballistic threat. To pursue these new armor developments, it will be necessary to have commercially available joining processes so that these new armors can be used cost effectively in production. TACOM has established several MMT projects covering joining ESR steel armor, welding complex alloys and shapes by laser, identifying electron beam welding applications, and optimizing both welding procedures and ultrasonic inspection of welds.

In general support of combat and tactical vehicles, TACOM is actively pursuing manufacturing technology in various areas. Projects are included for non-corrosive materials, chemical joining techniques, use of advanced microprocessors and multiplexing, high speed machining, and flexible machining pilot lines for batch production. Several projects are also proposed for the CAM area; these include a new machinery and equipment data base, computer simulation of production, application of adaptive control technology to vehicle components, and extension of CAD/CAM principles to spare parts manufacture.

The major requirements for propulsion and track are to develop production techniques to manufacture propulsion and drive systems for the M1 and future tracked and non-tracked combat and tactical vehicles. Fabrication and joining are of major concern. TACOM is actively pursuing production development of advanced casting techniques for integrally cast compressors, automated assembly line welding techniques, compliant joints to join metals and non-metals, and automated laser machining of complex machine alloys. Life cycle costs for various tactical and combat vehicles can be significantly decreased by eliminating premature failure or extending service life of components by reducing corrosion and deterioration. To support this area, TACOM is endeavoring to bring on line ceramic reinforced combustors.

The track and suspension category is constantly caught in the technical dilemma of producing more advanced systems to meet the ever increasing demands of higher performance in more adverse terrains while maintaining the overall reliability and maintainability of the system at or near current system costs. To achieve these objectives, the track area, as with the other categories, has been sub-divided into major thrust areas for better visibility and management control. These areas are general, rubber pads, shoes, track sprockets, wedges and suspension components. In these areas the general thrusts have been to introduce production techniques for metal matrix composites, non-metallic matrix composites, advanced rubber compounds, advance elastomeric compounds, lightweight castings, hard surface coatings and powder metallurgy.

In body/frame, the main thrusts are the conservation of fuel and material. To meet these requirements the objective is to reduce the overall weight of the vehicle, to increase its payload, and lower the life cycle cost of the systems by reducing the corrosion and degradation of the materials of construction. Here the main areas of concern are coatings, lightweight/composite structures, miscellaneous components, structural members, suspension systems, and seats and fuel tanks. Within these areas, work will be accomplished in elastic reservoir molding of reinforced trailer module bodies to reduce weight and costs, rapid curing automotive paints, new fungicidal paints, automated and computer controlled processes for joining metals with adhesives, plastic cab tops, maintenance free batteries with high impact resistance, and non-corrosive, lightweight non-structural tactical vehicle components.

TACOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
ARMOR	3177	7725	11082	12415	13025
BODY/FRAME	1158	327	970	1750	1200
DRIVE SYSTEM	360	2665	4960	5720	6517
GENERAL	1159	3730	5900	6250	6400
SUSPENSION SYSTEM	497	825	600	1620	1325
TRACK	500	650	1186	815	725
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TOTAL	6851	15922	24698	28570	29192

 * C A T E G O R Y *

 ARMOR

MMT FIVE YEAR PLAN
 RCS DRCMT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL

(4577) TITLE - ATTACHMENT OF COMBINATION ARMOR TO COMBAT VEHICLES

250 250

PROBLEM - COMBINATION ARMOR SYSTEMS PROVIDE LARGE BALLISTIC IMPROVEMENT BUT REQUIRE COMPLEX ATTACHMENT METHODS.

SOLUTION - IDENTIFY COST EFFECTIVE METHODS FOR PRODUCTION APPLICATION.

(4578) TITLE - ELECTRON BEAM WELDING FOR FERROUS COMPONENTS

375

375

PROBLEM - ELECTRON BEAM WELDING FOR FERROUS MATERIALS REQUIRES MODIFICATION TO ASSURE WELD QUALITY.

SOLUTION - IDENTIFY LOW COST AUTOMATED TECHNIQUES FOR APPLICATION OF ELECTRON BEAM WELDING OF FERROUS MATERIALS.

(4586) TITLE - IMPROVED SOLIDIFICATION AND SOUNDESS THICK ARMOR CASTING

762 731

PROBLEM - PRESENT CASTING TECHNIQUES NEED UPDATING IN ORDER TO EXPLOIT THE ADVANTAGE OF CASTING PROCESS.

SOLUTION - ESTABLISH IN PRODUCTION TECHNIQUES FOR CONTROLLING SOLIDIFICATION RATES IN MOLDS TO IMPROVE PROPERTIES AND REDUCE COSTS.

(5065) TITLE - ADVANCED TECHNOLOGY SURVEILLANCE COUNTERMEASURES MATERIALS

100 250

PROBLEM - USE OF MATERIALS WHICH WILL DEFEAT SURVEILLANCE MEASURES HAS NOT BEEN EXPLOITED IN PRODUCTION.

SOLUTION - PRODUCTION TECHNIQUES ARE NEEDED TO ASSURE SUFFICIENT QUALITY TO PERFORM SATISFACTORILY.

(5088) TITLE - HIGH-POWER ELECTRON BEAM WELDING IN AIR

300

PROBLEM - USE OF ELECTRON BEAM HAS NOT BEEN EXPLOITED.

SOLUTION - ESTABLISH PROCEDURES UTILIZING THIS NEW PROCESS FOR RAPID ECONOMICAL JOINING OF ARMOR MATERIALS.

(5094) TITLE - ALLOY AND ARMOR STEELS TREATED WITH RARE EARTH ADDITIVES

500

PROBLEM - ARMOR STEELS UTILIZED CONVENTIONAL PEOXIDIZING AND SCAVENGING PROCESSES IN STEEL MAKING.

SOLUTION - ESTABLISH TECHNIQUES TO TREAT STEELS WITH RARE EARTH ADDITIONS.

(6026) TITLE - POLYMER QUENCHANTS

150

PROBLEM - THE PRESENT USE OF OIL AS THE QUENCHING MEDIUM IN HEAT TREAT PLANTS INCREASES THE PROBABILITY OF QUENCH FIRES, AND IT EMITS CONSIDERABLE AMOUNTS OF SMOKE AND FUMES.

SOLUTION - ESTABLISH THE USE OF WATER-DILUTABLE POLYMERS AS A QUENCHANT TO AVOID FIRE AND POLLUTION PROBLEMS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- GENERAL (CONTINUED)

(6038) TITLE - HIGH DEPOSITION WELDING PROCESSES FOR ARMOR

459

700

600

150

PROBLEM - WELDING IS LABOR INTENSIVE AND HIGH COST IT IS A MAJOR COST DRIVER IN ARMOR VEHICLE MANUFACTURE.

SOLUTION - HIGH DEPOSITION WELDING PROCESSES WILL PERMIT WELDING TO BE ACCOMPLISHED MORE RAPIDLY THUS REDUCING MANPOWER REQUIREMENTS AND INCREASING PRODUCTIVITY.

(6057) TITLE - XM-1 COMBAT VEHICLE-MFG TECHNOLOGY

1088

1567

4650

5500

7000

8000

PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE XM1 CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE XM1 TO BE MANUFACTURED MORE ECONOMICALLY.

SOLUTION - IMPROVE PROCESSES FOR XM1 MFG. THESE INCLUDE THERMAL CUTTING, AUTOMATED METALLIZING, BI-CAST HP TURBINE NOZZLES, RSR NICKEL BASE SUPER ALLOYS, MONOCRYSTAL ALLOYS, CERAMIC COMBUSTORS, THERMALLY ASSISTED MACHINING, ETC.

(6059) TITLE - FVS COMBAT VEHICLE-MFG TECHNOLOGY

538

246

1460

2000

3000

4000

PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE FVS CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE FVS TO BE MANUFACTURED MORE ECONOMICALLY.

SOLUTION - IMPROVE PROCESSES FOR FVS MFG. THESE INCLUDE CAST ALUM COMPONENTS, LASER HEAT TREAT, SELF THREADING FASTENERS, ADHESIVE BONDING, PLASMA ARC WELDING, ETC.

COMPONENT -- HULL/BODY

(2001) TITLE - PROVIDE PROTOTYPE ROBOTS FOR AUTOMATED BLAST CLEANING

132

290

PROBLEM - HULLS OF VEHICLES ARE BLAST CLEANED TO REMOVE OLD PAINT AND RUST PRIOR TO PAINTING. THE CURRENT METHOD IS MANUAL. LABOR INTENSIVE, TIME CONSUMING, AND CREATES AN UNHEALTHY SITUATION FOR THE WORKERS.

SOLUTION - A FASTER, MORE PRODUCTIVE, AND MORE PRECISE BLAST CLEANING OPERATION WILL BE DEVELOPED USING INDUSTRIAL ROBOTS. A ROBOT SYSTEM USING THREE ROBOTS CONCURRENTLY WILL BE DESIGNED, INSTALLED, DEBUGGED, AND PROVEN OUT.

(4392) TITLE - JOINING DISSIMILAR METALS

278

85

PROBLEM - CURRENT ARMOR DESIGNS ONLY EMPLOY ONE TYPE OF METAL FOR WELDING.

SOLUTION - BI-METAL INSERTS WILL BE INVESTIGATED? COMBINATION MECHANICAL AND WELD JOINTS WILL ALSO BE STUDIED.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- HULL/BODY

(CONTINUED)

(5014) TITLE - FOUNDRY CASTING PROCESSES USING FLUID FLOW + THERM ANALYS.

150

PROBLEM - FOUNDRY CASTING PROCESSES ARE WASTEFUL OF RAW MATERIALS AND ENERGY.

SOLUTION - OPTIMIZE CASTING PROCESSES BY DIGITAL COMPUTER ANALYSIS OF ADVANCED FLUID FLOW AND THERMAL ACTIVITY.

(5091) TITLE - HEAVY ALUMINUM PLATE FABRICATION

300

PROBLEM - MANY COMBAT AND TACTICAL VEHICLE HULLS AND THEIR COMPONENTS ARE FABRICATED FROM HEAVY ALUMINUM PLATE. CUTTING THIS HEAVY ALUMINUM PLATE TO SPECIFIED CONTOURS AND WELDING THE PIECES TOGETHER REQUIRES A GREAT DEAL OF MANUAL LABOR.

SOLUTION - ESTABLISH THE CAPABILITY TO CUT HEAVY ALUMINUM PLATE RAPIDLY USING PLASMA ARC WITH NUMERICAL CONTROLS. PROCESS PARAMETERS WILL BE ESTABLISHED FOR HIGH DEPOSITION WELDING PROCESSES.

(6053) TITLE - WELDING SYSTEMS INTEGRATION

500

PROBLEM - OF ALL METAL WORKING PROCESSES EMPLOYED IN TRACKED COMBAT VEHICLES MANUFACTURING, WELDING IS THE MOST LABOR INTENSIVE AND AFTER MACHINING, THE MOST COSTLY. AUTOMATION WHICH COULD REDUCE THESE COSTS IS AS YET AN UNACHIEVED GOAL.

SOLUTION - UNDERTAKE A COORDINATED PROGRAM TO INTEGRATE EXISTING EXPERTISE AND TECHNOLOGY TO ADDRESS ONE APPLICATION (M1 HULL). EXPERTISE WILL BE IN AREAS OF WELDING PROCESS CONTROL, SENSORY TECHNOLOGY, STRESS ANALYSIS, AND COMPUTER CONTROL.

(6068) TITLE - PERMANENT SPLIT MOLD FOR NET SHAPE STEEL CASTINGS

300

PROBLEM - MANY PARTS, UNIQUE TO THE ARMY NEEDS, ARE FORGINGS WHICH REQUIRE EXPENSIVE AND EXTENSIVE MACHINING TO FINISH.

SOLUTION - PERMANENT MOLD CASTING PROCESS IS ABLE TO PRODUCE CLOSE TOLERANCES, THEREBY REDUCING OR ELIMINATING MANY COSTLY FINISHING OPERATIONS.

(6073) TITLE - ADAPTION AND AUTOMATION OF ACOUSTIC EMISSION WELD MONITORING

100

PROBLEM - IN PROCESSES OF HEAVY WELDING SUCH AS WITH ARMOR, RADIOGRAPHIC INSPECTION METHODS ARE COSTLY AND NOT TOTALLY RELIABLE

SOLUTION - ACOUSTIC SENSORS, USED WITH THE WELDING EQUIPMENT, MONITOR WELD QUALITY AS THE WELD IS MADE. REPAIRS MAY BE MADE IMMEDIATELY.

* C A T E G O R Y *

* BODY/FRAME *

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- COATING

(5047) TITLE - ENVIRONMENTAL COLOR ADAPTING COATINGS FOR COMBAT VEHICLES 150

PROBLEM - ARMY VEHICLE COLORS DO NOT BLEND WITH EVERY TERRAIN AND/OR ENVIRONMENTAL CONDITION.

SOLUTION - ESTABLISH PROCESS FOR APPLICATION OF COATINGS WHICH WILL CHANGE COLOR TO BLEND INTO ANY ENVIRONMENT.

(5068) TITLE - NEW ANTI-CORROSIVE MATERIALS AND TECHNIQUES 30 300 150 150 100

PROBLEM - METALLIC COMPONENTS ARE DETERIORATED BY THE ENVIRONMENT.

SOLUTION - ESTABLISH TECHNIQUES OF ECONOMICALLY APPLYING ANTI-CORROSIVE MATERIAL COATINGS TO THE COMPONENTS OF THE TACTICAL VEHICLE FLEET.

(6012) TITLE - PRODUCTION TECHNIQUES FOR THE APPLICATION NEW NONTOXIC PAINT 100 250 250

PROBLEM - THE OLD PAINT WITH METAL ANTI-FUNGICIDES HAVE BEEN DISAPPROVED BY THE FDA.

SOLUTION - DEVELOP NEW METHODS FOR APPLYING THE NEWLY DEVELOPED PAINTS.

COMPONENT -- FUEL TANKS

(6071) TITLE - PASSIVE EXPLOSION SUPPRESSION SYSTEM 300

PROBLEM - FUEL CONTAINERS IN A VEHICLE ARE A CRITICAL HAZARD IF ENEMY FIRE HITS THE VEHICLE. SERIOUS FIRES CAN RESULT.

SOLUTION - TECHNOLOGY HAS PROVIDED SEVERAL POSSIBLE ANSWERS TO THIS PROBLEM, AND THESE WILL BE EVALUATED AND APPLIED AS A SOLUTION.

COMPONENT -- LIGHTWEIGHT/COMPOSITE STRUCTURES

(5039) TITLE - INSULATED PLASTIC ENVIRONMENTAL TRAILER MODULES (ERM) 200 300

PROBLEM - MINIMUM EFFORT WAS EXERTED TO DEVELOP TECHNIQUES TO UTILIZE ALL PLASTIC, NON-STRUCTURAL VEHICLE BODIES.

SOLUTION - ESTABLISH THE FEASIBILITY OF USING ELASTIC RESERVOIR MOLDING REINFORCED BODIES FOR TRAILER MODULES.

(5042) TITLE - MANUFACTURING TECHNIQUES FOR NON-METALLIC TOTAL VEHICLES 300 250

PROBLEM - CURRENT VEHICLE COMPONENTS ARE MADE FROM METALS AND ARE EXCESSIVE IN WEIGHT AND TEND TO CORRODE. NEW NON-METALLIC MATERIALS ARE AVAILABLE AND COULD BE ADAPTED.

SOLUTION - VALIDATE FEASIBILITY OF MOLDING VEHICLE COMPONENTS FROM NON-METALLIC MATERIAL USING A MINIMUM OF PARTS AND ESTABLISH PRODUCTION TECHNIQUES.

FUNDING (\$000)

PRIOR	81	82	83	84	85
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COMPONENT -- LIGHTWEIGHT/COMPOSITE STRUCTURES (CONTINUED)

(6000) TITLE - LIGHTWEIGHT TILT-UP HOOD/FENDER ASSEMBLY

PROBLEM - CURRENT HOOD/FENDER ASSEMBLY MADE FROM STEEL STAMPINGS ARE TOO HEAVY FOR ONE MAN TO LIFT.

SOLUTION - REDUCE WEIGHT BY MANUFACTURING ITEMS FROM LIGHTWEIGHT FORMABLE PLASTIC.

(6058) TITLE - EXPLOSIVE BONDING OF COMPOSITE MATERIALS

PROBLEM - REQUIREMENTS TO BOND ALTERNATE PLIES OF STEEL AND ALUMINIUM MAY BE MET ONLY BY CUMBERSOME, EXPENSIVE AND SLOW PROCESSES.

SOLUTION - EXPLOSIVE BONDING BONDS STEEL AND ALUMINIUM QUICKLY, RELIABLY, AND CAN BE APPLIED TO ARMOR FABRICATION.

COMPONENT -- MISC COMPONENTS

(5019) TITLE - TACTICAL VEHICLE STORAGE BATTERY

PROBLEM - THE MAJOR CAUSE OF TACTICAL VEHICLE BATTERY FAILURE IS BATTERY CONTAINER BREAKAGE.

SOLUTION - PROVIDE NEW HIGH IMPACT PLASTIC CONTAINER TO INCREASE FIELD PERFORMANCE REQUIREMENTS AND TO ACCOMMODATE THE MAINTENANCE FREE CONCEPT ALREADY RELEASED IN LARGER MILITARY BATTERY SIZES.

(5069) TITLE - THREADED FASTENER-LOCKING ADHESIVES AND SEALANTS

PROBLEM - VIBRATION AND SHOCK IN MILITARY VEHICLE OPERATION DEFEATS MANY OF THE MOST EFFICIENT LOCKING MEANS FOR THREADED FASTENERS.

SOLUTION - DETERMINE AND APPLY OPTIMIZED AVAILABLE THREAD SEALING COMPONENTS FOR USE IN VEHICLE MANUFACTURE.

(6064) TITLE - ADHESIVES FOR TACTICAL VEHICLE ATTACHMENTS

PROBLEM - THE FEASIBILITY OF USING ADHESIVES IN PLACE OF WELDING HAS BEEN ESTABLISHED, BUT WORK NEEDS TO BE DONE TO ESTABLISH OPTIMUM ADHESIVES AND CONDITIONS FOR ITS APPLICATION IN THE PRODUCTION ENVIRONMENT.

SOLUTION - ESTABLISH A PROCESS FOR APPLYING ADHESIVE BONDING TO THE ATTACHMENT OF ITEMS TO ARMORED VEHICLES.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- STRUCTURAL MEMBERS

(4579) TITLE - INDUSTRIAL PRACTICES FOR WELDING CONSTRUCTIONAL ALLOY STEELS

150 100

PROBLEM - A WIDE VARIETY OF HIGH STRENGTH CONSTRUCTIONAL ALLOYS STILL WILL BE USED IN GREATER QUANTITIES TO MEET WEIGHT REQUIREMENTS.

SOLUTION - DOCUMENT RECOMMENDED WELDING PRACTICES AND PROCEDURES TO IDENTIFY SIGNIFICANT FACTORS AFFECTING PRODUCTION QUALITY FOR THE VARIOUS MATERIALS AND EQUIPMENT.

(6067) TITLE - AUTOMATED PROTOTYPE FRAME WELDING

77 77

PROBLEM - THE WELDING OF SPECIALIZED TRUCK AND TRAILER FRAMES BY THE MANUAL METHOD IS TIME CONSUMING AND COSTLY.

SOLUTION - ESTABLISH A UNIVERSAL FIXTURE THAT WILL USE AUTOMATIC WELDING PROCEDURES.

COMPONENT -- SUSPENSION SYSTEM

(4002) TITLE - ROBOTIZED WELDING OF M113A2 SUSPENSION

421

PROBLEM - THE CURRENT METHOD OF WELDING THE M113A2 SUSPENSION SYSTEM IS TIME CONSUMING AND LABOR INTENSIVE.

SOLUTION - ROBOTIZE THE WELDING OPERATION TO REDUCE MAN HOURS FROM ELEVEN TO SIX FOR A LABOR SAVING OF 58 DOLLARS PER HULL.

* C A T E G O R Y *

*DRIVE SYSTEM *

COMPONENT -- ENGINE

(TT13) TITLE - XM1 COMBAT VEHICLE-AGT1500 TURBINE ENGINE

2000 4000 6000

PROBLEM - THE NEED TO REDUCE COST(PRODUCTION AND LIFE CYCLE COSTS) AND IMPROVE PERFORMANCE OF THE ENGINE REQUIRES THE USE OF NEWER AND INNOVATIVE TECHNOLOGY.

SOLUTION - NEW PROCESSES AND TECHNOLOGIES, BETTER HIGH TEMP MATERIALS, AND REDUCED LABOR INTENSIVE MANUFACTURING OPERATIONS WILL ACHIEVE LOWER COSTS, IMPROVED PERFORMANCE AND FUEL EFFICIENCY.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- ENGINE		FUNDING (\$000)				
		PRIOR	81	82	83	84 85
(CONTINUED)						
(5053)	TITLE - MANUFACTURE OF ENGINE COMPONENTS OF CERAMIC			500	550	
<p>PROBLEM - FABRICATION OF HIGH EFFICIENCY, HIGH TEMPERATURE DIESEL ENGINES REQUIRES ADVANCED MATERIALS. ENGINES FABRICATED WITH CERAMIC COMPONENTS HAVE BEEN DEMONSTRATED IN R+D BUT MANUFACTURING METHODS FOR SERIAL PRODUCTION COMPONENTS ARE LACKING.</p> <p>SOLUTION - RECENT RESEARCH EFFORTS INDICATE THAT ENGINE COMPONENTS FROM HIGH STRENGTH STRUCTURAL CERAMICS (SILICON NITRIDE, SILICON CARBIDE) ARE FEASIBLE. THIS EFFORT WILL ESTABLISH QUANTITY PRODUCTION OF CERAMIC COMPONENTS OF CONSISTENT QUALITY.</p>						
(5085)	TITLE - PROD TECH FOR FAB OF TURBINE ENGINE RECUPERATOR	1436	250			
<p>PROBLEM - CURRENT METHOD REQUIRES A LARGE NUMBER OF WELDS TO FABRICATE COMPONENT.</p> <p>SOLUTION - ESTABLISH PROCEDURE UTILIZING A LASER BEAM TO GREATLY INCREASE WELDING SPEED.</p>						
(5097)	TITLE - INTEGRALLY CAST LOW COST COMPRESSOR	716	50			
<p>PROBLEM - TURBINE BLADES AND DISCS MUST HAVE ADEQUATE LOW AND HIGH CYCLE FATIGUE PROPERTIES. AXIAL COMPRESSOR STAGES ARE DESIGNED AS SEPARATELY BLADED ASSEMBLIES.</p> <p>SOLUTION - INTEGRALLY CAST THE AXIAL COMPRESSOR STAGES AND THE CENTRIFUGAL ROTOR TO ELIMINATE MANY COSTLY MACHINING OPERATIONS.</p>						
(6000)	TITLE - AUTOMATED COMPUTER CONTROL LASER MACHINING			250	250	
<p>PROBLEM - CONVENTIONAL MACHINING OF DIFFICULT TO MACHINE MATERIALS IS VERY EXPENSIVE. RAPID TOOL WEAR AND LOCALIZED HEATING OF THE WORKPIECE IMPACT REMOVAL RATES AND METALLURGICAL CHARACTERISTICS.</p> <p>SOLUTION - THIS PROGRAM WILL DEVELOP TECHNIQUES FOR LASER MACHINING BY NUMERICAL CONTROL.</p>						
(6018)	TITLE - JOINING OF ATTACHMENTS TO CERAMICS			100	150	
<p>PROBLEM - CURRENT METHOD OF JOINING METALS TO CERAMIC JOINTS ARE NOT RELIABLE AND HAVE POOR LIFE.</p> <p>SOLUTION - INVESTIGATE USE OF JOINTS THAT ARE COMPLIANT OR USE INTERMEDIATE CONNECTING PHASE.</p>						
(6019)	TITLE - GRAIN BOUNDARY IMPROVEMENT PROCESSING FOR CERAMICS			100	120	
<p>PROBLEM - EFFECT OF HIGH TEMPERATURE ON CERAMICS GRAIN BOUNDARIES LIMIT THEIR APPLICATION.</p> <p>SOLUTION - UPSCALE DEVELOPED TECHNIQUES FOR DEVELOPING A NONGLASS BOUNDARY OR ELIMINATE THE GRAIN BOUNDARY PHASE.</p>						

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- ENGINE

(CONTINUED)

(6020) TITLE - PRODUCTION OF REINFORCED CERAMIC COMBUSTORS

PROBLEM - TECHNIQUE FOR LARGE SCALE PRODUCTION OF COMBUSTORS NOT AVAILABLE. THESE COMBUSTORS IMPROVE ENGINE PERFORMANCE GREATLY.

SOLUTION - UPSCALE LABORATORY PROVEN TECHNIQUE FOR FABRICATING COMBUSTOR FOR PRODUCTION.

(6028) TITLE - PRODUCTION QUALITY CONTROL BY AUTO INSPECTION EQUIPMENT(CAM)

PROBLEM - THE INCREASED COMPLEXITY OF COMBAT VEHICLES HAS RESULTED IN EXCESSIVE TIME AND HIGH SKILL LEVEL REQUIREMENTS FOR INSPECTION AND TEST.

SOLUTION - DEVELOP AUTOMATED DIAGNOSTIC EQUIPMENT TO REDUCE TIME AND LOWER SKILL REQUIREMENTS. AUTOTESTING OF WIRING HARNESES AND ENGINES WILL BE ACCOMPLISHED. AUTOMATION OF INSPECTION RECORDS WILL BE ACCOMPLISHED.

(6055) TITLE - PRODUCTION OF IMPROVED ANTI-CORROSIVE MATERIALS

PROBLEM - TO INCREASE THE EFFICIENCY OF TURBINE ENGINES CREEP RESISTANT NON-CORRODING, HIGH TEMPERATURE STRENGTH MATERIALS ARE REQUIRED. PRESENTLY EXPENSIVE METALLIC SUPERALLOYS AND CERAMICS ARE BEING USED.

SOLUTION - IN MECHANICAL ALLOYING, METAL POWDERS ARE COLD WELDED IN HIGH-ENERGY MILLS. THE PROPERTIES OF THESE ALLOYS ARE SUPERIOR OVERALL TO THE PRESENTLY USED MATERIALS. MANUFACTURING TECHNIQUES FOR MASS PRODUCTION WILL BE ESTABLISHED.

(6056) TITLE - SIMPLIFIED TEST EQUIP FOR INT COMB ENGINES(ASTE/ICE)

PROBLEM - SUITABLE TRANSDUCERS AND SENSORS ARE NOT READILY AVAILABLE FOR INSTALLATION ON MILITARY VEHICLES FOR BUILT-IN DIAGNOSTICS.

SOLUTION - TRANSDUCERS ARE TO BE DEVELOPED TO FULFILL THE NEEDS FOR DIAGNOSTIC CAPABILITY.

(6072) TITLE - LASER VIBRATION DEPOT INSPECTION SYSTEM

PROBLEM - FOR DEPOT OVERHAUL WORK IN POWER TRAIN COMPONENTS, NO DEVICE IS ON HAND FOR DIAGNOSING CAUSES OF VIBRATION, AND THE RESULTANT DAMAGE TO ENGINES.

SOLUTION - LASER VIBRATION SENSING DEVICES CAN BE DEVELOPED FOR OVERHAUL INSPECTION DIAGNOSTICS. THEY HAVE BEEN PROVEN IN SIMILAR APPLICATIONS.

247

60

250 200

305 320

400 400

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- ENGINE

(CONTINUED)

(7001) TITLE - AUTOMATED DYNAMOMETER CONTROL FOR STANDARDIZED INSP TESTING

200 400

PROBLEM - ALL ENGINES ARE TORN DOWN WHILE 20% COULD BE RESTORED TO OPERATION WITHOUT PHYSICAL TEARDOWN. TEARDOWN IS 1/3 COST OF OVERHAUL. ALL ENGINES REBUILT REQUIRE A 4 HOUR DYNAMOMETER OPERATIONAL TEST CYCLE.

SOLUTION - AUTOMATE CURRENT MANUALLY OPERATED DYNAMOMETER TEST CELLS ALLOWING PRESHP INSPECTION WITHOUT TEARDOWN AND REDUCING REBUILT ENGINE RUN-IN TIME BY EIGHTY PERCENT.

COMPONENT -- TRANSMISSION

(5005) TITLE - COLD FORGED GEARS TO DRAWING TOLERANCES

300 300

PROBLEM - MACHINING AND OTHER PROCESSES ADD COST TO THE FINISHED COMPONENT.

SOLUTION - ESTABLISH A MFG PROCESS TO RESULT IN A FINISHED GEAR TO DRAWING TOLERANCES FROM BAR STOCK AT AMBIENT TEMPERATURES.

(5024) TITLE - GEAR DIE DESIGN AND MFG UTILIZING COMPUTER TECHNOLOGY (CAM)

405 640

PROBLEM - THE CONTROL OF DIMENSIONAL TOLERANCES OF FORGED BEVEL GEARS PRESENTS A UNIQUE PROBLEM SINCE THESE GEARS ARE NOT MFG. TO THEORETICAL EQUATIONS. THE BEVEL GEAR IS NOT DEFINED DIMENSIONALLY BUT IS PRESENTED AS REQUIREMENTS FOR TOOTH BEARING PATTERNS.

SOLUTION -- THIS PROGRAM WILL ELIMINATE THE CURRENT TRIAL AND ERROR METHODS BY UTILIZING CAD/CAM METHODS AND INTERACTIVE GRAPHICS TECHNIQUES. EXCESSIVE SCRAP, UNEXPECTED DIE WEAR AND BREAKAGE, AND THE HIGH COST OF FORGING DIES WILL BE ADDRESSED.

(5083) TITLE - UPSCALING OF ADVANCED POWDER METALLURGY PROCESSES

834 300

PROBLEM - POWDER METALS PROCESSES HAVE NOT BEEN UTILIZED IN LARGE COMPONENTS

SOLUTION - EST PROCESSES WHICH PRODUCE HIGH DENSITY HIGH STRENGTH LARGE COMPLEX SHAPES.

(5086) TITLE - SURFACE HARDENING AND ALLCYING OF TRANS SYSTEMS WITH LASERS

475 405

PROBLEM - FLAME AND INDUCTION HARDENING IS EMPLOYED TO SURFACE HARDEN VEHICLE TRANSMISSION PARTS. THESE PROCESSES ARE INEFFICIENT.

SOLUTION - ESTABLISH PARAMETERS AND CONTROLS NEEDED FOR LASER SURFACE HARDENING

* CATEGORY *

*GENERAL *

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(TT11) TITLE - MANUFACTURING TECHNOLOGY-ARMY DEPOTS

PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE REBUILD FUNCTIONS OF THE DEPOTS CAN BE IMPROVED AND MADE MORE EFFICIENT BY INCORPORATING NEW TECHNOLOGIES

SOLUTION - INTRODUCE NEWER STATE-OF-THE-ART METHODS OF MANUFACTURING INTO DEPOT OPERATIONS.

1500 2000 3400

(TT12) TITLE - SURFACE TREATMENT OF COMPONENTS

PROBLEM - PERFORMANCE OF MANY ITEMS IS DEPENDENT ON ITS SURFACE CONDITION. NEW METHODS OF ALTERING SURFACES ARE NOT BEING EMPLOYED.

SOLUTION - ESTABLISH TECHNIQUES FOR ALTERING MATERIAL SURFACE CONDITIONS SO AS TO IMPROVE PERFORMANCE AND/OR REDUCE COST

300 300 400

(4588) TITLE - MOLDED PLASTIC ORDNANCE ELECTRICAL CONNECTOR

PROBLEM - METALLIC SHELL ELECTRICAL CONNECTORS ARE COSTLY AND SUSCEPTIBLE TO CORROSION AND OTHER PROBLEMS.

SOLUTION - DEVELOP A MEANS OF MANUFACTURING CONNECTORS WITH PLASTIC REPLACING METAL SHELLS.

100 100

(5016) TITLE - IMPROVED HIGH STRENGTH ALUMINUM COMPONENTS

PROBLEM - COMMERCIALLY AVAILABLE HIGH STRENGTH ALUMINUM ALLOYS NEED IMPROVEMENT IN DUCTILITY AND FRACTURE TOUGHNESS.

SOLUTION - ESTABLISH PRODUCTION PROCESSES UTILIZING ADVANCES IN BOTH METAL SOLIDIFICATION AND THERMAL MECHANICAL WORKING OF ALUMINUM ALLOYS.

200 200 250

(50R2) TITLE - FLEXIBLE MACHINING SYSTEM PILOT LINE FOR TCV COMPONENT

PROBLEM - PARTS FOR TRACKED COMBAT VEHICLES ARE TYPICALLY NOT MANUFACTURED IN LARGE QUANTITIES. BECAUSE OF THIS, MASS PDN TECHNOLOGIES THAT RESULT IN LOWER PDN COSTS ARE NOT USED.

SOLUTION - THE ADVANTAGES OF MASS PDN CAN BE REALIZED IN PRODUCING MEDIUM QUANTITY SIZE LOTS BY A CONCEPT KNOWN AS, FLEXIBLE MACHINING SYSTEMS. THIS PROJECT WILL ADVANCE THE FMS TECHNOLOGY MAKING IT FEASIBLE TO UTILIZE FMS FOR THE MFG OF ARMY MATERIEL.

1558 779 750 500 200 200

(5090) TITLE - IMPROVED AND COST EFFECTIVE MACHINING TECHNOLOGY

PROBLEM - MACHINE DATA ON NEWER MATERIALS AND NEW REMOVAL RATES, ARE NOT ESTABLISHED.

SOLUTION - ESTABLISH DATA WHEREAS THE NEW MACHINING EQUIPMENT MAY BE UTILIZED WITH MAXIMUM EFFICIENCY.

609 30 150 150

FUNDING (\$000)

PRIOR	81	82	83	84	85

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(5093) TITLE - MANUFACTURING METHODS FOR HIGH SPEED MACHINING FERROUS ALLOY

PROBLEM - FAST CHIP REMOVAL FOR FERROUS ALLOYS HAVE NOT BEEN ESTABLISHED FOR PRODUCTION.

SOLUTION - ESTABLISH FAST CHIP REMOVAL FOR PRODUCTION CONDITIONS.

(6014) TITLE - AUTOMATED PRODUCTION OF MULTIPLEXING NETWORKS FOR COMBAT VEH

PROBLEM - ADVANCED TECHNIQUES FOR ELECTRICAL POWER DISTRIBUTION AND VEHICLE CONTROL WILL USE ADVANCED MICROPROCESSORS AND MULTIPLEXING AND INTRODUCE NEED FOR NEW ASSEMBLY TECHNIQUES.

SOLUTION - COMPUTER AIDED DESIGN AND MANUFACTURING WILL BE APPLIED TO ASSEMBLY OF THE COMPLEX ELECTRONIC SYSTEMS.

(6025) TITLE - MANUFACTURING LASER FACILITY

PROBLEM - THE FEASIBILITY OF USING LASERS FOR METAL PROCESSING IS ESTABLISHED. IMPLEMENTATION IS IMPEDED BY THE COST OF FACILITIZATION.

SOLUTION - ESTABLISH A FACILITY TO IMPLEMENT LASER TECHNOLOGY IN PRODUCTION.

(6030) TITLE - COMPUTER SIMULATION OF TCV MANUFACTURING PROCESSES

PROBLEM - THE LONG LEAD TIMES REQUIRED IN THE MATERIAL ACQUISITION PROCESS OF TRACKED COMBAT VEHICLES (TCV) DO NOT ALLOW COMPONENTS TO REFLECT THE LATEST TECHNOLOGIES. THIS LEADS TO DELAYS AND EXCESSIVE COSTS.

SOLUTION - SIMULATING THE MANUFACTURING PROCESS DURING THE VEHICLE DEVELOPMENT PHASE WILL IDENTIFY TOOLING, OPTIMUM MANUFACTURING PROCESSES, OPTIMUM PRODUCTION LINE, AND POTENTIAL PRODUCTION PROBLEMS. IT WILL ASSIST INNOVATION AND PROVIDE FOR ACCURATE PLANNING.

(6041) TITLE - APPLICATION OF ADAPTIVE CONTROL

PROBLEM - SENSORS WHICH RECOGNIZE AND SIGNAL PHENOMENAL CHANGES HAVE BEEN DEVELOPED AND DEMONSTRATED. APPLICATION OF THESE TO ADAPTIVE CONTROL CAN ADVANCE AUTOMATION TO THE LEVEL OF "PUSH BUTTON" FACTORIES, BUT LITTLE OR NOTHING HAS BEEN DONE IN THIS AREA.

SOLUTION - STATE-OF-THE-ART SENSORS WILL BE ADAPTED TO A CNC MACHINING CENTER TO ADVANCE ITS PERFORMANCE BEYOND PRESENT LEVELS OF EFFICIENCY. THIS WILL PROVIDE A PROVEN CAPABILITY WHICH CAN BE EMPLOYED ON OTHER MACHINES.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- MISCELLANEOUS

(CONTINUED)

(6042) TITLE - SPARE PARTS MANUFACTURE BY CAD/CAM

PROBLEM - SPARE PARTS FOR TRACKED COMBAT VEHICLES ARE PROCURED IN SMALL QUANTITIES AND IN A GENERALLY RANDOM MANNER. THIS PROCUREMENT PRACTICE RESULTS IN HIGH COSTS AND SHORTAGES DUE TO EXTENDED DELIVERY SCHEDULES.

SOLUTION - THE ARMY HAS AVAILABLE AND IS DEVELOPING A NUMBER OF CAD/CAM PROGRAMS DIRECTED TO THE MANUFACTURE OF ITEMS FOR INITIAL ACQUISITION. THE RESULTS OF THESE PROGRAMS WILL BE ADDRESSED TO SPARE PARTS ACQUISITION TO PROVIDE IMPROVED PROCUREMENT.

250 250 250

(6054) TITLE - ADVANCED METROLOGY SYSTEMS INTEGRATION

PROBLEM - THE METROLOGY METHODS USED IN MILITARY VEHICLE MANUFACTURE, IN GENERAL, EMPLOYS CONTACT GAUGES MANUALLY EMPLOYED. THIS REPRESENTS A SUBSTANTIAL PART OF THE COST OF OUR MILITARY VEHICLES.

SOLUTION - NON-CONTACT, IN-PROCESS GAUGING (ELECTRO-OPTICAL AND LASER) WILL BE ADAPTED TO A VEHICLE MACHINING OPERATION. SOLID PHOTOGRAPHY WILL BE ADAPTED TO MEET THE MEASURING REQUIREMENTS OF COMPONENTS SUCH AS TURBINE BLADES.

350 500 500 500 500

* C A T E G O R Y *

*SUSPENSION SYSTEM *

COMPONENT -- ROAD WHEELS

(4559) TITLE - PRESSURE CASTING TECHNIQUES FOR ALUMINUM COMPONENTS

PROBLEM - ALUMINUM CASTINGS REQUIRE GATINGS AND RISERS WHICH UTILIZE LARGE AMOUNTS OF MATERIAL WHICH HAVE TO BE REMOVED FROM THE CASTINGS AND USED AS SCRAP REMELT. THIS CONTRIBUTES TO INCREASED COSTS OF COST ITEMS.

SOLUTION - ESTABLISH MANUFACTURING PROCESSES UTILIZING LOW PRESSURE CASTING TECHNIQUES, THEREBY ELIMINATING THE NEED FOR EXCESS GATING AND TOTALLY ELIMINATING RISERS.

250 450

(6050) TITLE - BLAST HARDENED ROAD WHEELS FOR TRACKED COMBAT VEHICLES

PROBLEM - COMPOSITE ROAD WHEELS ARE MAJOR COMPONENTS FOR BLAST HARDENED TCV SUSPENSION SYSTEMS. CURRENT HAND FABRICATION WILL HAVE TO BE SCALED-UP. MAIN PROBLEMS ARE ENCAPSULATING WHEELS IN POLYURETHANE ELASTOMER AND AUTOMATED FABRICATION OF RINGS AND RIMS.

SOLUTION - RINGS AND RIMS WILL BE WOUND ON MULTIPLE MANDREL EQUIPMENT USING GLASS CLOTH TAPE WITH VERY ACCURATE RESIN DISTRIBUTION, CURED IN MATCHED METAL MOLDS, AND THEN THE POLYURETHANE ENCAPSULANT WILL BE INJECTED AROUND THE WHEEL ASSEMBLY AND CURED.

350 400

COMPONENT -- ROAD WHEELS

(CONTINUED)

(6076) TITLE - AUTOMATED DEFOT INSPECTION OF ROAD WHEELS

247

PROBLEM - THE ADHESION, SPECIFIC GRAVITY, AND HARDNESS TESTS ARE MADE ON LOTS CONTAINING NO MORE THAN 50 ROADWHEELS AND ALSO REQUIRE THE DESTRUCTION OF APPROXIMATELY 700 ROADWHEELS EACH YEAR.

SOLUTION - ELIMINATE DESTRUCTIVE LOT SAMPLING ACCEPTANCE BY THE IMPLEMENTATION OF AN ON-LINE ULTRASONIC ROADWHEEL INSPECTION SYSTEM.

COMPONENT -- SPRINGS

(6011) TITLE - SPRINGS FROM CARBON-FIBER PLASTIC-COMPOSITES

250 250

PROBLEM - STEEL SPRINGS FOR TACTICAL VEHICLES ARE HEAVY AND SUBJECT TO FAILURE FROM FATIGUE. CARBON FIBER COMPOSITES ARE LIGHTER AND HAVE EXCELLENT FATIGUE RESISTANCE.

SOLUTION - THE TECHNOLOGY IS KNOWN TO MANUFACTURE LEAF SPRINGS FROM CARBON-FIBER PLASTIC COMPOSITES, HOWEVER THE TECHNIQUES FOR MASS PRODUCTION NEED TO BE DEVELOPED.

COMPONENT -- TORSION BAR/TUBE

(5002) TITLE - FABRICATING TORSION BAR SPRINGS FROM HIGH STRENGTH STEEL

150 275

PROBLEM - ENGINEERING ALLOY STEELS CAN BE HEAT TREATED TO A MAXIMUM WORKING HARDNESS WHICH REQUIRES LARGE DIAMETER BARS THEREBY INTERFERING WITH DESIGN FITS AND INCREASING WEIGHT.

SOLUTION - ESTABLISH METHODS OF FABRICATING TORSION BARS UTILIZING 300000 MINIMUM YIELD MATERIALS.

(5074) TITLE - PRODUCTION TECHNIQUES FOR COMBAT VEHICLE SUSPENSION SYSTEMS

300 400

PROBLEM - SUSPENSION SYSTEMS OF COMBAT VEHICLES ARE UNDERGOING A LARGE DESIGN CHANGE TO PROVIDE INCREASED MOBILITY PERFORMANCE BY UTILIZING NEWLY DEVELOPED COMPONENTS. APPLICATION OF THE ADVANCED SYSTEMS WILL INCREASE ACQUISITION COSTS.

SOLUTION - APPLY ADVANCED MANUFACTURING TECHNIQUES TO REDUCE OR PREVENT INCREASES IN THE ACQUISITION COSTS.

(6029) TITLE - MANUFACTURING PROCESS FOR METAL MATRIX COMPOSITES

300 200 300 300

PROBLEM - METAL MATRIX COMPOSITES MAKE POSSIBLE COMPONENTS HAVING REDUCED WEIGHT AND INCREASED STRENGTH THE MANUFACTURING METHODS FOR PRODUCTION MUST BE DEVELOPED BY UPSCALING LAB METHODS.

SOLUTION - UPSCALE AND OPTIMIZE MANUFACTURING METHODS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- WHEELS

(5038) TITLE - NON-PNEUMATIC COMBAT TIRE FABRICATION TECHNIQUES

PROBLEM - PNEUMATIC TIRES ON TACTICAL VEHICLES ARE SUBJECT TO COMBAT DAMAGE.
SOLUTION - ESTABLISH PROCESSING TECHNIQUES TO ASSURE RELIABLE HIGH MOBILITY,
NON-PNEUMATIC TIRES.

120 225

(6070) TITLE - TIRE PRESERVATION COATING

PROBLEM - TIRE DETERIORATION FROM AGE AND WEATHER CAUSES INTOLERABLE WASTE.
SOLUTION - PRESERVATIVE COATINGS ARE KNOWN PRODUCTS AND NEED TO BE EVALUATED
AND INCORPORATED INTO THE ARMY'S INVENTORY.

150 100

* C A T E G O R Y *

* TRACK *

COMPONENT -- RUBBER PADS

(4003) TITLE - RUBBER INJECTION MOLDING OF DOUBLE PIN TRACK

PROBLEM - REBUILD OF TRACK BLOCKS FOR COMBAT VEHICLES IS CURRENTLY BEING
ACCOMPLISHED WITH 1940'S TECHNOLOGY. THIS REQUIRES THE BONDING OF RAW RUBBER
TO THE STEEL BASE COMPONENT AND COMPRESSION CURING FOR TWO HOURS.

345 118

SOLUTION - ESTABLISH AN AUTOMATED (ROBOT) INJECTION MOLDING PROCESS THAT WILL
CURE THE RUBBER TRACK PAD ON THE TRACK SHOE IN TEN MINUTES OR LESS.

(4005) TITLE - WATER JET MATERIAL REMOVAL SYSTEM

PROBLEM - CURRENT PRODUCTION METHODS OF REMOVING RUBBER FROM TRACK COMPONENTS
ARE LABOR INTENSIVE AND PRESENT ENVIRONMENTAL AND SAFETY HAZARDS TO THE
WORKERS.

125

SOLUTION - DESIGN, WRITE SPECIFICATIONS, AND FABRICATE A PROTOTYPE PRODUCTION
HIGH PRESSURE WATER JET SYSTEM TO REMOVE THE RUBBER FROM THE TRACK
COMPONENTS.

(5075) TITLE - RUBBER FOR MILITARY TRACK

PROBLEM - TRACK LIFE IS HELD AT ITS PRESENT LEVEL BY FAILURE OF RUBBER
COMPONENTS SUCH AS BUSHINGS, PADS AND BLOCKS.

200 200

SOLUTION - ESTABLISH PRODUCTION PROCESSES FOR NEWLY DEVELOPED ELASTOMER
COMPOUNDS FOR TRACKS.

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- SHOES

(4004) TITLE - AUTOMATED DISASSEMBLY OF DOUBLE PIN TRACK

316 247

PROBLEM - DISASSEMBLY OF DOUBLE PIN TRACK SHOE SET ASSEMBLIES IS CURRENTLY LABOR INTENSIVE USING MANUAL HAND TOOLS RESULTING IN LOW PRODUCTIVITY.

SOLUTION - ESTABLISH AN AUTOMATED DISASSEMBLY PROCESS FOR DOUBLE PIN TRACK SHOE ASSEMBLIES.

(4513) TITLE - HIGH DENSITY POWDER METAL PARTS FOR COMBAT VEHICLES

100 175

PROBLEM - TRACK COMPONENTS WEAR EXCESSIVELY REQUIRING THE TRACK TO BE ADJUSTED AND/OR REPLACED FREQUENTLY.

SOLUTION - FABRICATE COMPONENTS BY COMPACTING HIGH WEAR ALLOYS FROM POWDER.

(4514) TITLE - HARD FACING OF TRACK SHOES

150

PROBLEM - NO DEFINITE PROCEDURE AND HARD FACING MATERIALS HAVE BEEN ESTABLISHED AS THE MOST SATISFACTORY REPAIR COMBINATION FOR TRACK SHOES. PRIOR EFFORTS HAVE BEEN MADE IN BOTH THE USA AND EUROPE BUT NOTHING DEFINITE HAS RESULTED.

SOLUTION - THE TRACK SHOE GROUSERS WILL BE BUILT UP BY DEPOSITION USING A HARD FACING PROCESS. THE PROCESS WILL BE AUTOMATED AND TOOLING WILL BE DESIGNED TO ALLOW THE EQUIPMENT TO FOLLOW THE CONTOURS OF THE TRACK SHOE GROUSERS.

(5043) TITLE - FABRICATION TECHNIQUES FOR NON METALLIC TRACK

250 350 400

PROBLEM - CURRENT METALLIC TRACK CONTRIBUTES A LARGE PERCENTAGE OF TOTAL VEHICLE WEIGHT.

SOLUTION - VALIDATE FABRICATION FEASIBILITY FOR BUILDING AN ALL PLASTIC COMBAT VEHICLE TRACK

(5054) TITLE - LASER SURFACE HARDENING COMBAT VEHICLE COMPONENTS

175 175 175

PROBLEM - PRESENT METHODS OF SURFACE HARDENING INPUTS HEAT OVER LARGE SURFACE AREA.

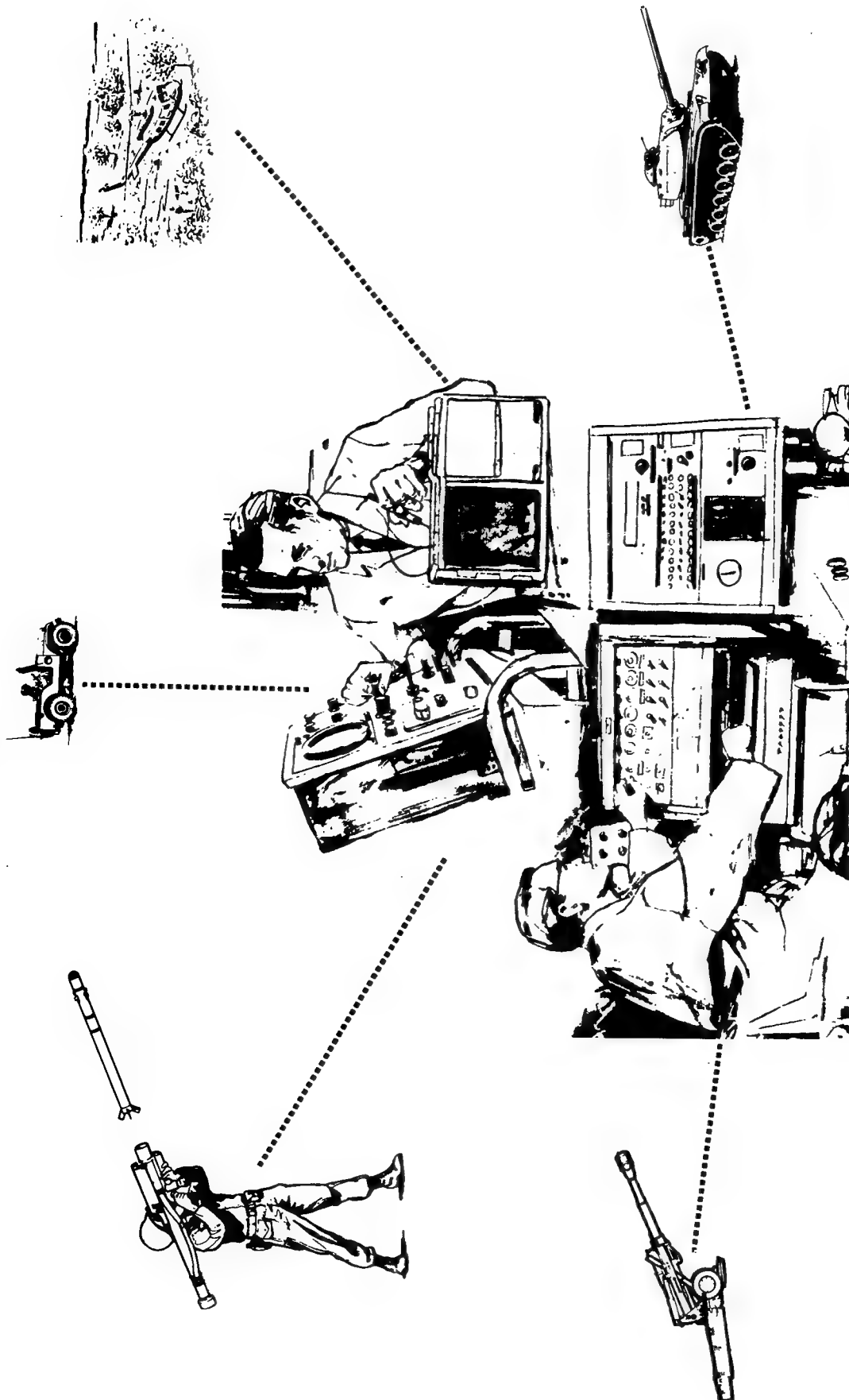
SOLUTION - ESTABLISH LASER BEAM HARDENING PROCEDURES WITH ITS ATTENDANT FINE BEAM SMALL AREAS RAPID HEATING.

(5092) TITLE - RHEOCAST PRESSURE CASTING FOR COMBAT VEHICLE PARTS

275- 275

PROBLEM - PRESSURE CASTING UTILIZING INTERNAL REINFORCEMENTS HAVE NOT BEEN DEVELOPED.

SOLUTION - PRODUCTION TECHNIQUES WILL BE DEVELOPED TO PRODUCE CASTINGS OF NEAR NET SHAPE WITH REINFORCEMENTS.



**TEST AND EVALUATION COMMAND
(TECOM)**

CATEGORY

PAGE

Testing----- 229

US ARMY TEST AND EVALUATION COMMAND

(TECOM)

TECOM, with headquarters at Aberdeen Proving Ground, MD, is the primary developmental testing agency for the US Army. TECOM plans, conducts, and reports on development tests performed during the life cycle of Army materiel, and evaluates foreign materiel for possible US acquisition. Additional testing is performed as a service to the commodity commands upon their request. The testing organization consists of the aircraft development test activity, three environmental testing activities, five proving grounds (one of which serves as the third environmental activity), and a national missile range. Facilities are located in the continental United States, the Panama Canal Zone and Alaska.

Individual investigations into production test procedures and evaluation techniques are accomplished through TECOM's MMT program. In view of TECOM's mission and the intended results of the MMT efforts (to improve test procedures), the majority of the work is accomplished in-house.

TECOM's MMT efforts are grouped under two general headings: documentation and resource conservation. Individual efforts are funded from these "parent programs." Current funding constrains TECOM to an annual program that supports approximately one-half of their planned efforts.

TECOM
C O M M A N D F U N D I N G S U M M A R Y
(THOUSANDS)

CATEGORY -----	FY81 ----	FY82 ----	FY83 ----	FY84 ----	FY85 ----
TESTING	750 ----	1010 ----	1300 ----	1400 ----	1500 ----
TOTAL	750	1010	1300	1400	1500

 * C A T E G O R Y *

 TESTING

MMT FIVE YEAR PLAN
 RCS DRCHT 126

FUNDING (\$000)

PRIOR 81 82 83 84 85

COMPONENT -- DOCUMENTATION

(5072) TITLE - TECOM PRODUCTION TEST METHODOLOGY ENGINEERING MEASURES

1837 281 379 490 525 565

PROBLEM - STANDARD TEST PROCEDURES ARE REQUIRED TO INSURE THAT TEST ACTIVITIES COLLECT DATA AND CONDUCT TESTS IN A UNIFORM MANNER TO SUPPORT THE DT EVALUATION PROCESS. ACCEPTANCE TEST PROCEDURES ARE REQUIRED TO VERIFY PRN HARDWARE SPECIFICATION COMPLIANCE.

SOLUTION - MAINTAIN TEST OPERATIONS PROCEDURES AND ACCEPTANCE TEST PROCEDURES TO TEST SYSTEMS FOR SPECIFICATION COMPLIANCE.

COMPONENT -- RESOURCE CONSERVATION

(5071) TITLE - TECOM PRODUCTION METHODOLOGY ENGINEERING MEASURES

2210 337 454 585 630 675

PROBLEM - ARTILLERY, VEHICLE AND ELECTRONIC CONVENTIONAL TEST CAPABILITIES NEED TO BE UPGRADED TO PROVIDE MORE TIMELY ACCURATE TEST DATA FOR THE TEST AND EVALUATION PROCESS.

SOLUTION - DEVELOP A PROGRAM TO UPGRADE CONVENTIONAL TEST CAPABILITIES AT THE TEST ACTIVITIES.

(5073) TITLE - TECOM PRODUCTION TEST METHODOLOGY ENGINEERING MEASURES

664 132 177 225 245 260

PROBLEM - FIELD TESTING COMPLEX WEAPON SYSTEMS IS COST PROHIBITIVE. SIM TECHNIQUES MUST BE DEVELOPED TO REDUCE THE COST AND MANPOWER REQUIRED TO PERFORM GOVT TESTS ROUTINE. PDN TEST PROCESSES MUST BE AUTOMATED BECAUSE OF PERSONNEL REDUCTIONS AT TEST ACTIVITIES

SOLUTION - DEVELOP SIMULATION TECHNIQUES TO TEST COMPLEX WEAPON SYSTEMS AND AUTOMATE PRODUCTION TEST PROCESSES.

APPENDICES

INDUSTRY GUIDE

This section of the MMT Program Plan explains the Army programming cycle for the MMT Program. The objective of the MMT Program is to develop new manufacturing methods and processes that will reduce the cost of producing weapon systems. The program consists of approximately 200 projects annually that concentrate on improving and/or developing manufacturing methods, techniques and processes.

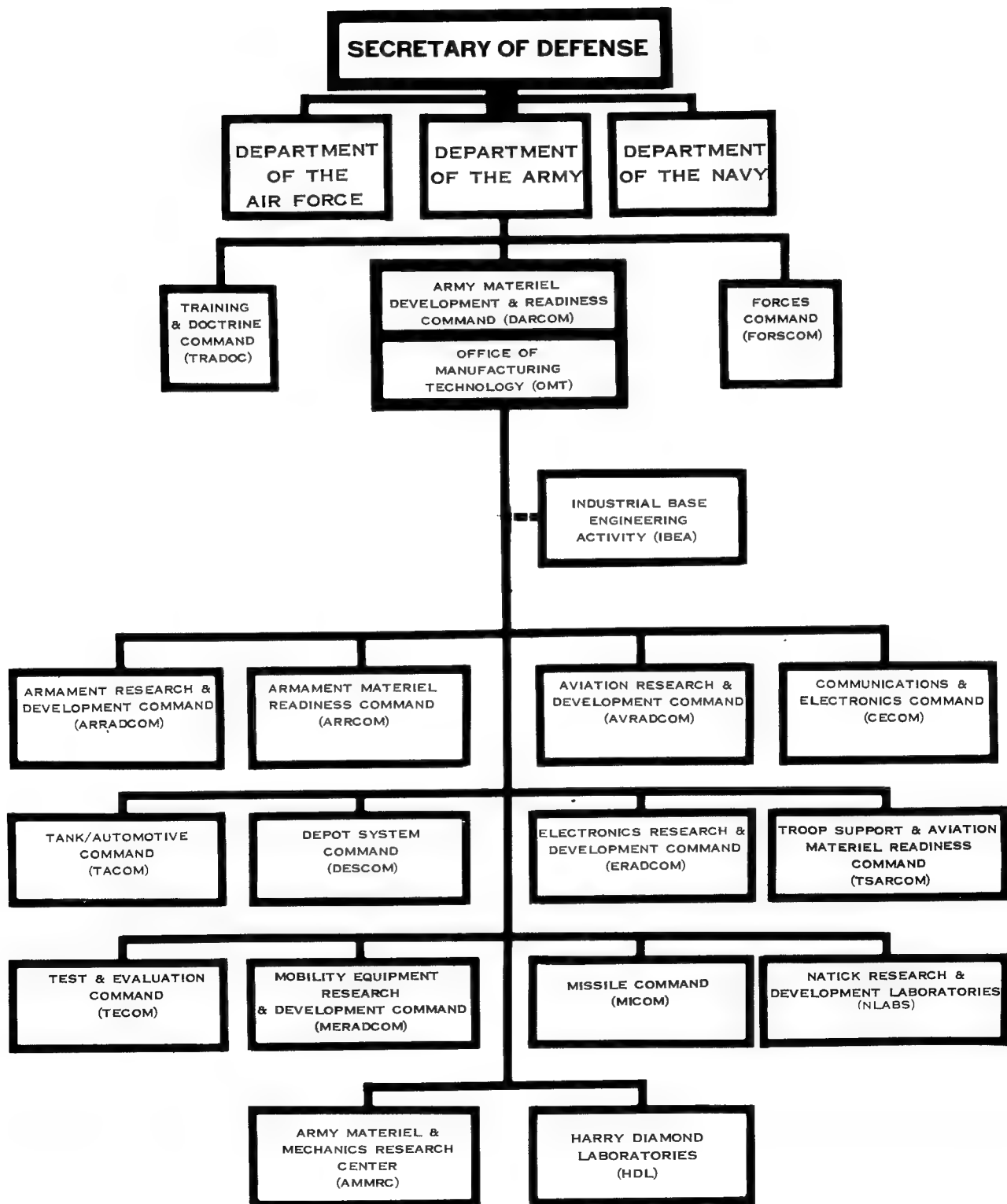
The scope of the MMT Program covers all three of the military services. Within the Army, the Office of Manufacturing Technology (OMT) has been established to provide overall program responsibility. Functional responsibility is at the commodity oriented, Major Subcommands (SUBMACOM'S). The SUBMACOM'S plan, formulate, budget, and execute individual projects. The Industrial Base Engineering Activity (IBEA) assists OMT on the technical aspects of the Manufacturing Technology Program. The organizational chart on the next page depicts this supporting framework.

Throughout the Program Plan reference is made to various appropriations. These appropriations are identified in the Army Management Structure (AR 37-100-FY) and are established by the US Congress as a standard accounting system. Most MMT efforts are funded through the Procurement Appropriations which include (1) Aircraft, (2) Missile, (3) Weapons and Tracked Combat Vehicles, (4) Ammunition, and (5) Other. A few projects receive funds for the Operations Maintenance, Army (OMA) appropriation.

Identification of manufacturing problems is the first step in developing an MMT Program. Problem areas are conceptualized and compiled into a planning document (the Program Plan). At the date of the publication, the Program Plan contains one funded year, one programmed year and three planned years. As the program cycle proceeds the concepts are refined and project proposals are developed. A diagram depicting this programming cycle is shown on page A-3. To fully understand the entire programming cycle one must realize that DOD budgets on a Fiscal Year (FY). The FY starts on 1 October and ends the last day of the following September. For example, on 1 October 1980, the Army began the first quarter of FY81.

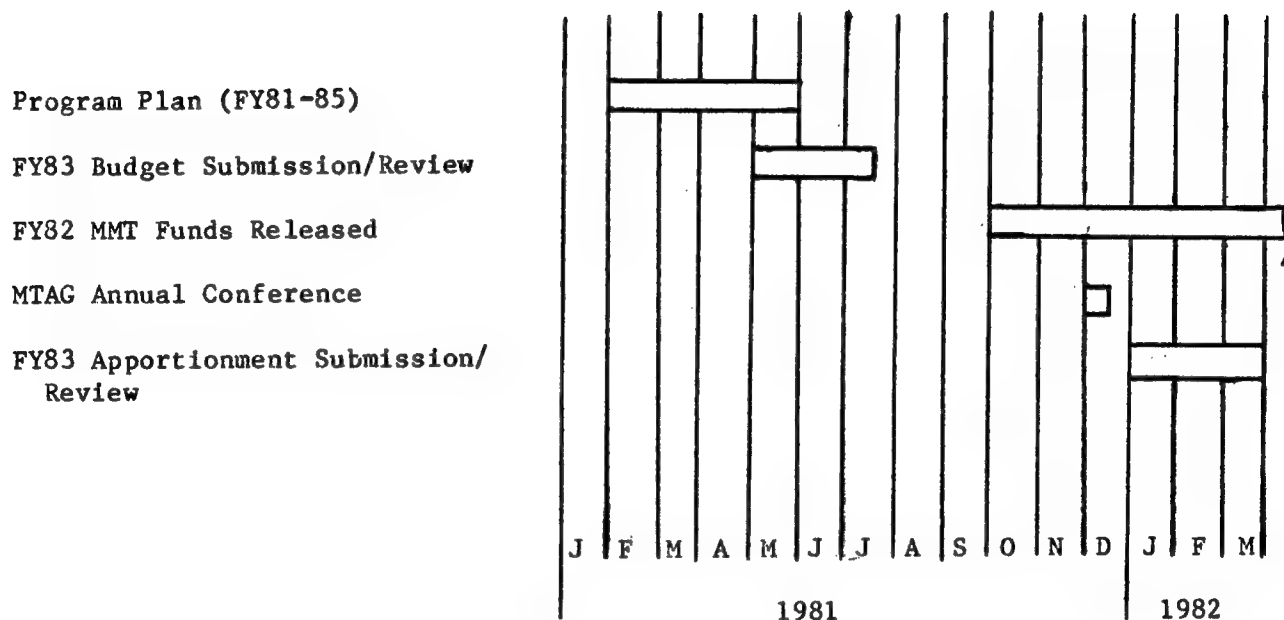
The following programming cycle chart depicts the various activities and stages that MMT projects go through. Concepts are first identified in the five year plan according to the projected year funding is expected. Each year these concepts are reevaluated and move forward until they reach the budget phase. Industry has the opportunity to participate during the annual MTAG conference. At this gathering the current program, the latest budget project and the Program Plan are discussed.

UNITED STATES ARMY MATERIEL DEVELOPMENT & READINESS COMMAND (DARCOM)



Calender Year Activities
MMT Planning/Budgeting/Review Cycle

YEARLY ACTIVITIES



The programming cycle shown above starts with the Program Plan. This document consolidates individual submissions from the SUBMACOM'S and develops the planned program. Because Army budget guidance provides "ceilings," potential projects must be prioritized which results in some being excluded or slipped. Inclusion in the Plan does not guarantee that the project will be funded. The level of funding is dependent upon what Congress will appropriate each year.

As projects approach the start of the funding cycle specific objectives and work scopes are developed. These projects are documented in what is known as a P-16. A P-16 is simply the format that is utilized to document data elements such as estimated cost, economics, and description of work. (The P-16 format is described in AR 700-90).

The budget submission represents the first P-16 submitted for inclusion in the program. This submission is followed about nine months later by the more definite apportionment submission. Projects are then funded when the new fiscal year begins. Although this is the normal planning cycle, a project can enter the planning cycle at any point in time. Such a project would be known as a late start submission and funding is usually at the expense of another project.

Criteria for actually funding individual projects include technical, operational, and economical feasibility. The potential for technical success, the means by which the results will be implemented, the potential payback or return on investment and the interrelationships that exist between factors are all evaluated.

For a more comprehensive understanding of the MMT program, the following list of documents is provided for reference:

DOD Instruction 4200.15, Manufacturing Technology Program

AR 700-90, The Army Industrial Preparedness Program

AR 37-100, The Army Management Structure

AR 11-28, Economic Analysis and Program Evaluation for Resources
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PA 5197, Tactical and Support Vehicles)

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PA 5397, Other Support)

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